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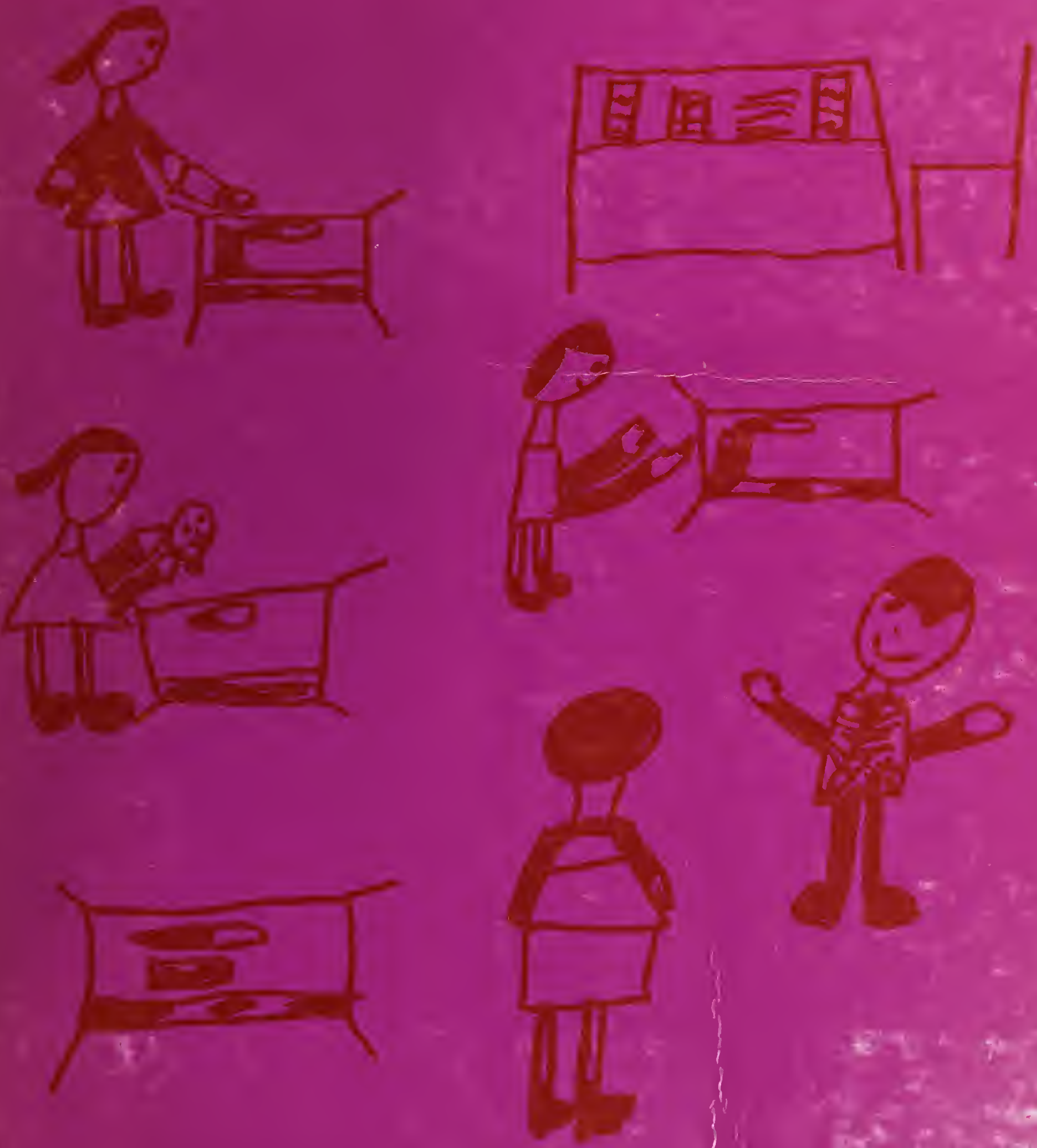

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Study of Educational Facilities

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(A, E, and T) and are numbered consecutively within
each category. Reports designated A are
Administrative. Those designated E and T are
Educational and Technical respectively.

The drawings used to decorate this book
were done in January, 1968, by Grade 2 children
at Grace Street Public School, Toronto,
in response to a request from SEF to depict schools
and teachers as these children see them.
We wish to express our thanks to the children;
to their teacher, Miss Clara Adams; and to
Mr. Howard Dierlam, Director of Arts and Crafts,
Board of Education for the City of Toronto.

The frontispiece picture was taken at Lord Lansdowne
Public School, Toronto.
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SEF Report E1

Educational Specifications and User Requirements for Elementary (K-6) Schools

THE METROPOLITAN TORONTO SCHOOL BOARD

SEF Report E1

Educational Specifications and User Requirements for Elementary (K-6) Schools

Published by The Ryerson Press, Toronto, for the
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Some psychologists believe that the only kind of knowledge which is genuinely possessed by the child and genuinely useful to him is that which he discovers for himself by means of active inquiry.

William G.Davis Public School, Pickering Township. W.Saccoccio, Architect. Photo by Hans Geerling.

Preface

Invariably, the beginning of a project such as the Study of Educational Facilities (SEF) is prompted by an accumulation of needs not being satisfactorily met. The search for better ways of dealing with the learning needs of Metro's rapidly expanding and increasingly diversified school population, and the attempt to find an acceptable method of raising tax dollars adequate for educational needs are only two of many problems currently demanding solution. Another—and one which is especially relevant to this Study—is the need to form an overall picture of the direction of educational change in the very near future.

To any serious student of our educational system, it should be evident that the whole structure is in need of constant and long-range study and planning. The conduct of public education in a rapidly shifting environment can no longer remain dependent upon short-term or *ad hoc* decisions. Only by the deliberate creation of long-range and predictive educational planning systems can problems of learning, teaching, curriculum, educational finance, and school building design be resolved.

Put in its simplest terms, the Metropolitan Toronto School Board has established the Study of Educational Facilities to estimate the nature and direction of the changes facing the public education system in Metropolitan Toronto. Using this information, the Study is to recommend the kinds of school building facilities required to accommodate the needs of education in the present and future. Faced, as it is, with the task of requesting tax dollars now for school buildings which will easily last into the twenty-first century, the Metropolitan Toronto School Board believes it imperative that these buildings be sufficiently adaptable in their designs to meet future educational requirements.

The feasibility of such a study in Metropolitan Toronto was considered by the Board during 1965. At the Ontario Department of Education, the Minister of Education, the Honourable William G.Davis, had already established a Division of School Planning and Building Research under its first director, Mr.Frank Nicol. Mr.Davis had also created a Minister's Advisory Committee on School Design under the chairmanship of Dr.Kenneth F.Prueter. Both Mr.Nicol and Dr.Prueter had shown great interest in the School Construction Systems Development (SCSD) study in California, which at that time was coping with the problem of providing flexible interior space in school buildings. The California study, which had begun in 1961-62, was financially supported by Educational Facilities Laboratories (EFL) of New York City.

As early as 1965, the Minister of Education had shown considerable interest in a closer examination of the possibility of a project similar to SCSD in Ontario. The Chairman of his Advisory Committee on School Design brought the matter to the attention of the Metropolitan School Board on March 9, 1965. He stressed the fact that Metropolitan Toronto was thought to be "the best locale for such a study due to the framework of co-operation which now exists among boards of education [in the area], and to the volume and diversity of its annual needs." The Board agreed to consider this request. At the same time, it was agreed that the Metropolitan School Board, in consultation with the Education Department's Division of School Planning and Building Research, should prepare a proposal to EFL soliciting its support for such a study. In late 1965, after a period of consideration and negotiation, and following encouragement from officials of EFL, the Study of Educational Facilities was approved by the Metropolitan School Board.

The Study of Educational Facilities has been established under the auspices of the Metropolitan Toronto School Board to operate for a three-year period. The Board has agreed to support it financially, with the provision that grants received from other agencies will reduce the Board's total financial commitment. During 1966, EFL made the first of its grants, and it has indicated that its future financial support will cover approximately one-third of the total cost of the Study. The Ontario Department of Education provided a grant during its fiscal year ending March 31, 1967, and during the current fiscal year 1967-68 it has pledged further financial support.

The specific terms of reference of the Study of Educational Facilities authorize a major study of school building in the Metropolitan Toronto area with particular reference to

(1) development of systems and components specifically for school use,

(2) more effective application of principles of modular construction in achievement of greater flexibility of interior design,

(3) reduction of the cost per sq. ft. of school building construction so as to provide better value for expenditures in terms of function, initial cost, environment, and maintenance,

(4) analysis of the problem of short-term accommodation, including an evaluation of the present use of portable classrooms and consideration of alternative ways of meeting short-term needs.

To review and monitor the detailed work of the Study, the Metropolitan Toronto School Board established an Advisory Committee under the chairmanship of Mr.David L.Tough, Associate Director of Education for the Borough of North York. This Committee consists of trustees of the Metropolitan Toronto School Board, representatives from the Ontario Department of Education and EFL, educators, architects, engineers, financial officials, a representative from the Building Research Division of the National Research Council, and officials of the Metropolitan Toronto School Board. In selecting Committee members, the School Board was fortunate in securing representation, as well, from the Ontario Institute for Studies in Education and the University of Toronto. The Advisory Committee's recommendations concerning the Study of Educational Facilities are transmitted to the Building and Sites Committee of the Metropolitan Toronto School Board.

The permanent staff of the Study of Educational Facilities consists of two co-directors, one of whom is the Academic Director and the other the Technical Director. Assisting them is an Executive Officer responsible for directing the detailed research work. There are five persons engaged in educational research and four in technical research. As required, additional staff will be requested and outside technical consultants retained.

It is believed that for some time to come the public education systems of Metropolitan Toronto will continue to be three-level ones. Therefore, early in the Study, it was decided to issue three separate academic reports, each dealing with the educational functions and needs of a different school level. This first Report is concerned with elementary (K-6) schools (though its recommendations are intended equally for K-5 schools, should these be desired). Two subsequent Reports will deal with intermediate (7 and 8, or 6, 7, 8, or 7, 8, 9) schools, and senior (9-13 or 10-13) schools.

In approaching the assigned task, the SEF staff was keenly aware that liaison with practising educators would contribute in a major way to the validity of its conclusions. Our Study is fortunate in being served by some 150 educators organized in 22 committees. These men and women, representing every level of educator from teacher to superintendent and every borough of Metropolitan Toronto, devoted many hours, over a period of five months, to gathering much of the information and data used in this Report. Oriented as they were to current trends in education and the future needs of our elementary school systems, they have given a direction and a concreteness to our Study which could not otherwise have been obtained. Their willingness to continue this work as the Study moves on to the needs of the other two school levels indicates the high degree of concern felt for education in Metropolitan Toronto by its professional and permanent staff.

We also wish to acknowledge the co-operation received from the staff of the Education Centre Library, Toronto Board of Education. Their willingness and competence have proved invaluable in the preparation and writing of this Report.

SEF Staff, December, 1967.

In some new schools, teachers have many opportunities to learn from one another, to make curriculum adjustments for pupils' learning needs, to share instructional tasks, to make more balanced evaluations of each child's learning progress, and to plan for more efficient use of instructional materials and equipment.

Huron Street Public School, Toronto.

Photo by Michael Spivak

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The only unqualified prediction we are prepared to make about schools of the future is that there will be greater overall variability.

Dilworth Elementary School, San Jose, California.

Introduction

This Introduction is intended to answer a series of questions about this Report. How did we interpret our assignment? Within our definition of the situation, how did we proceed? What are the outcomes? What opinions do we now have about these outcomes?

We believe that readers who take a few minutes to share these thoughts will find them helpful in understanding, utilizing, and criticizing this Report.

The assumptions we have made and the decisions we have taken are clearly not the only ones available. Others would have chosen differently. We, in another time or situation, would also have chosen differently. Our intention in this Introduction is neither to justify our approach nor to defend our conclusions. Rather, it is to describe and explain as clearly and objectively as possible the development, content, and limitations of this Report. Thus, by spelling out our perception of reality, we hope to make the Report more comprehensible and the feedback to it more pointed and effective.

The Report is intended primarily for use by teams of educators and architects designing new school facilities. To be useful it must be understood. To become more understandable, it must be refined. Such refinement can be achieved only with honest criticism.

Terms of Reference

The core of our assignment in this Report was to describe current educational[1] needs, at the elementary (K-6) level, in Metropolitan Toronto. In this description we were to attend particularly to innovations both at the discussion and at the implementation stage. It was hoped that we could define the forms and general direction of major changes and estimate the rates at which such changes were occurring. From this basis, requirements for physical facilities were to be developed which would ensure that emerging educational innovations could readily be adopted in future schools.

This was the mandate of the academic phase of SEF: to state precisely the facilities required by school users today and in the foreseeable future. The mandate, in our opinion, did not extend either to the design of an ideal educational system or to the extensive remodelling of the existing system. Despite their obvious appeal, it was early agreed that such courses of action were not only beyond our terms of reference but beyond our capability within the limits of our situation.

A number of limits, givens, or restrictions are built into our situation. Each of the limits, considered alone, is intuitively justifiable. However, when these limits are juxtaposed in series, the extent of the overall problem becomes apparent. Here are some of the admonitions most frequently voiced among the staff:

Be practical, but don't be reactionary;
Consider the future, but don't be ridiculous;
Work from theory and evidence to requirements, but remember that dollars are limited;
Be as specific as possible, but don't presume to dictate educational policy or formulate technical solutions;
Do scholarly work, but don't forget lay audiences;
Be thorough and accurate, but stay on schedule.

Another way of looking at these limits is to view them as a list of the types of error which were readily available to us. Undoubtedly, we have to some extent erred in most of these directions in some section of the Report. However, the errors result from our attempts to deal with a complex situation rather than from ignorance of it or unwillingness to confront it. We hope that, with honest criticism, we will be able to improve this and future Reports.

Procedures

We tried to use the resources available to us as efficiently as possible. We saw as our prime resources the literature and the profession. Thus we read, we visited "lighthouse schools," and we talked with practising educators. Then we thought and argued in an effort to attain an adequate understanding of the problem.

It was apparent from the beginning that the learning-teaching process and educational activities were crucial foci. The extent to which our statements of user requirements could be valid would be limited by the extent of our understanding of the nature of learning and teaching and by the degree to which we would be able to describe precisely the learning-inducing behaviors performed in schools.

---

[1] While we are fully aware of distinctions among the terms "education," "socialization," "schooling," and "instruction," we have elected to use the term "education" to refer to the activities of the public schools.

From our standpoint, the logically necessary starting points were the objectives of education and the nature of learning. Curriculum and teaching both seem to be behavioral extensions of the facts of learning and of educational objectives as these are expressed in practice. From there we moved to "current trends," using this term to designate a special category of practices—those which are not, at the moment, in very common use but which are supported by evidence as to their effectiveness and/or by a considerable weight of professional opinion.

Two other classes of factors impinge on the development of user requirements—local community educational objectives, and costs. In the final analysis, these factors determine both what is wanted and what is economically and socially feasible at the level of community action. In this way, theory and abstract alternatives are passed through a "reality filter" on their way to becoming practical user requirements.

It was agreed that the statement of user requirements should include a description of the activities expected to occur and a brief statement of the rationale for these activities. The description of activities was intended to explain the nature and duration of each behavior, the numbers and types of people involved, and the spaces and equipment to be used. Logical extrapolation from such activity descriptions was expected to yield definitive performance requirements for physical facilities. The user requirements were to be statements of the performance required of facilities which would properly house these activities.

Extreme difficulties were encountered in the attempt to describe activities behaviorally. The most significant activities—thinking, understanding, synthesizing—are covert and largely independent of facilities. The simultaneity of biological sensing—seeing, hearing, feeling—and of many educational activities defies conventional detailed analysis. Little conclusive evidence is available, and relationships between facilities, activities, and consequences are seldom logically tight. Output was achieved through the laborious system of write-review-rewrite. For most chapters this sequence was repeated many times.

To make them more readily usable, strictly technical specifications were extracted from verbal descriptions and placed on the technical data sheets which appear at the end of each chapter in Part 3.

Results

The overall structure of the Report can most easily be seen by examining its Table of Contents. Parts 1 and 2 are composed of educational specifications; Part 3 consists of user requirements.

In Part 1, consideration is given to the aims and objectives of education, the learning process, the teaching process, curriculum, and current educational trends. These chapters constitute an attempt to analyze and understand the current educational scene from these various standpoints. Anomalies, interrelationships, and alternatives are highlighted.

In Part 1, the overwhelming discrepancy between what is known and what urgently needs to be known is illustrated. At the same time, the empirical and conceptual bases upon which educational practice could presently be based are delineated. Finally, pros and cons of a number of current trends, representing some forms which future educational practice could assume, are outlined. No attempt was made, however, to predict future discrete forms of education in Metropolitan Toronto. The only unqualified prediction we are prepared to make is that in the foreseeable future there will be greater overall variability.

Part 2 is a "reality filter" between Parts 1 and 3. Chapter 6 is a summary of Part 1 and an effort to interpret it within the framework of local conditions. Chapter 7 includes a simulation of currently required elementary (K-6) facilities in light of the Metropolitan Toronto Ceiling Cost Formula.

Part 3 is a series of statements of user requirements for the various sections of an elementary (K-6) school. Particular emphasis was given to areas which could house new or expanding educational functions. Data sheets at the end of Chapters 8 to 14 constitute a technical summary of the requirements for each area. These sheets are intended to be used with the text, and it is believed that their placement will facilitate such use. Chapter 15 is a discussion of services required for the proper functioning of the school building. It contains a number of illustrations.

Assessment

Inevitably, authors of reports such as this express the wish that more time had been available and suggest that more work needs to be done. We believe that more intensive treatment than we have given is clearly warranted in the areas of technology, teaching, ergonomics, school organization, and finance. Inquiry is also needed into the relationship between the physical environment and the learning process, and the place of the school in the urban fabric. At a different level, additional work is needed with respect to grounds (outdoor education), special education, health, and libraries (integrated information systems). We hope that SEF will be able to make an attack on some of these problems in the near future.

The ultimate criterion against which this Report must be judged is its utility. To what extent does the Report help educators and designers to develop more functional school accommodations? This test can be made only as persons responsible for planning new facilities try to use it.

This Report is designed to be a working document for teams of educators who are developing academic specifications and user requirements for schools to be built in Metropolitan Toronto. It aspires to indicate an approach to and a language for the writing of user requirements. It is necessarily general, because it is intended to encompass the full range of available alternatives rather than to provide full detail for a particular solution. If this approach is followed in the design of a number of actual schools and the resulting information fed back to SEF, useful revision of this document will be possible. Only such experimentation can provide the necessary refinement and increase in specificity.

Reactions to this Report are solicited from all readers and users. Only with their co-operation can future SEF reports and revisions serve more adequately their intended purpose—improvement in society through better educational facilities.

Part 1

The Process of Elementary Education

"If we dramatically improve our ability to predict, shape, or—to use a stronger word—manipulate human behavior, then the direction which this shaping will take becomes all-important."

Photo courtesy The Ontario Institute for Studies in Education, Toronto.

Chapter 1
Objectives

The problem of aims in public education is a thorny one. Professional journals for administrators, researchers, and teachers are full of statements concerning the need for definite behavioral objectives. It is essential, say the journals, to be specific about objectives when constructing curricula and developing learning materials—especially those which are of the programmed or computer-assisted variety. Professor Floyd G.Robinson of the Ontario Institute for Studies in Education states the problem forcefully:

> *. . . The basis of my concern is that the technology of behavioral change could rapidly outstrip our ability to formulate coherent goals. . . . If we dramatically improve our ability to predict, shape, or—to use a stronger word—manipulate human behavior, then the direction which this shaping will take becomes all-important.*[1]

Actually, educators seem to have little difficulty in setting up the most immediate kinds of objectives. For example, teachers can work easily with a goal such as mastery of 50 spelling words in three weeks. Significant aid in specifying objectives on slightly higher levels than this has recently been given in professional books for teachers. The main idea in one of these, for example, is that teachers must express their intentions clearly in terms of (1) "what the learner will be doing when demonstrating his achievement," (2) under what conditions the learner will be making this demonstration, and (3) according to what criteria the learner's performance will be judged.[2] There has also been progress in classifying the outcomes teachers and curriculum builders say they are seeking. A group of distinguished U.S. researchers, working since 1948 on a comprehensive set of classifications for describing and ordering these, have divided them into three main types: cognitive (or intellectual), affective (or emotional), and psychomotor (those which have reference to motor skills). Within the two categories so far investigated (cognitive and affective), objectives are arranged in order of complexity and degree of internalization, respectively.[3]

Educators also appear to have little trouble with the broadest type of objective. School boards and departments of education regularly issue printed circulars and booklets listing "the aims of education" as they perceive them. Two recent and local examples are *Aims of Education for Public Schools,* published in 1965 by the Board of Education for the Township of North York, and *Public School Programme for the Township of Etobicoke,* published by Etobicoke's Board of Education in 1966. In the first we discover such objectives as helping the elementary school child "to become a responsible person," "to develop essential skills," and ". . . to become a moral person." In the second we find a statement concerning the responsibilities of the Etobicoke public schools coupled with quotations from the Ontario Department of Education's *Programme of Studies*. In 1950, a massive Royal Commission report listed nine aims for Ontario schools, ranging from developing "the capacity to apprehend and practise basic virtues," to developing "the concept that education is a continuing process beyond the school."[4] A new treatment of the subject is expected soon from the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario.

What appears to present difficulty most often is the middle range of objectives—those which are more general than spelling mastery but less general than "preparing children to live in a democratic society." There seems to be widespread agreement on the most general level, for example, that education should aim at the full development of each child's potential. But what does this mean, on the middle—or policy—level? Does it mean placing some adolescents in an academic program and others in a vocational one? Or does it mean providing some kind of general education for all? One educator will argue that streaming promotes optimal development of individual talents. Another will insist that it does not. Both accept the same general principle, but each interprets the principle in a different way. And suppose both believed that streaming was the best means to full development of individual potential. Might they not disagree over the relationship of streaming to another general-level aim—the preparation of pupils for participation in a democratic society? It is easy to see that clarity concerning the purposes of education on many levels is an important asset in preparing plans for school buildings. It is also easy to see that attainment of such clarity is not a simple matter.

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[1] Floyd G Robinson, "Academic Psychology and Educational Practice . . . A New Attempt at Fusion," *OPA Quarterly XIX* (Summer, 1966), 59-60.

[2] Robert F.Mager, *Preparing Objectives for Programmed Instruction* (San Francisco: Fearon Publishers, 1961). p. 53.

[3] Benjamin S.Bloom, David R Krathwohl, *et al., Taxonomy of Educational Objectives. The Classification of Educational Goals, Handbook I: Cognitive Domain* and *Handbook II. Affective Domain* (New York: David McKay Co. Inc., 1956 and 1964)

[4] Royal Commission on Education in Ontario, *Report* (Toronto: King's Printer, 1950), pp. 36-39

The Philosophers and Aims

Among philosophers of education there has developed in recent years a tendency to dismiss broad generalities about the aims of education as meaningless or, at least, useless. John Dewey, the famous American philosopher, often equated education with growth and claimed that education, like growth, has no extrinsic aim:

> *The educational process has no end beyond itself; it is its own end. . . .*
> *Since in reality there is nothing to which growth is relative save more growth, there is nothing to which education is subordinate save more education.*[5]

Among Dewey's reasons for insisting that education has no aim "beyond itself" was his view that there are no values in the absolute sense—only a day-to-day process of valuing in which people choose one thing over another. Also a factor was Dewey's preference for the broadest possible definition of education.

But Dewey's position on ethics and his comprehensive definition of education are not the only possible bases for the view that education has no aim beyond itself. A present-day philosophic writer, R.S.Peters, has arrived at a similar position on aims from an analysis of what is generally meant when people use such expressions as "being an educated person."

To talk of "an educated person," says Peters, is to speak about someone who has been "improved" or "made better" by being "initiated into a worth-while form of life." Although Peters has in mind "certain general criteria of being educated," he feels that it is absurd to search for "one agreed aim of education."[6]

> *Countless aims of education are . . . possible depending upon what features of a worth-while form of life any educator thinks it most important to foster. . . . It is one thing to give arguments for general aims; it is quite another to say which particular one should be emphasized in any particular set of circumstances.*[7]

The Schools and the Community

In discussing "the aims of education"—or even the aims of any part of the educational system—it is easy to confuse two different concepts. One is the concept of aims as a collection of *ideals*. Here we use such phrases as "intellectual growth," "development of moral character," "capacity for citizenship." Here we are discussing what the aims of the school *should* be. The other concept of aims is quite different. Here we find the *actual* aims of the system—those objectives which could be inferred by a man from Mars who simply observed the system in operation. The contrast between the two concepts of aims is the contrast between what we would like to see and what our actions tend to accomplish. We say, for example, that we wish to foster "critical thinking" and "creativity." But should we really blame the man from Mars (or journalist June Callwood,[8] for that matter) for concluding that we are often working toward rote memorization and conformity?

With the above *caveats* in mind, let us look at the elementary schools and try to see whether they are guided, at present, by any single, dominant collection of ideals. Let us also consider the relationship of these ideals with practice.

The objectives of the public elementary school are inevitably interwoven with those of the community which supports it. According to the educational sociologists Brookover and Gottleib,[9] the school is necessarily and inevitably a part of the social system, functionally interrelated with other parts of the system. If there were complete unanimity within our communities concerning their own aims and objectives *qua* societies, there might be fewer conflicts concerning the aims and objectives of public education. North American communities, however, are pluralistic in the extreme. Their goals for education are often conceived in a vague way, which probably reflects a desire to achieve some goals which are incompatible with one another.[10] Many different views play a part in shaping educational policies. "Example can be piled on example to show that education is in a state of flux, responding and yielding, sometimes resisting those forces which see schools... as instruments of social policy."[11]

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[5] John Dewey, *Democracy and Education* (New York: Macmillan Co., 1915).

[6] R.S.Peters, "Aims of Education—A Conceptual Inquiry," *Philosophy and Education* (Toronto: Ontario Institute for Studies in Education, 1967), p. 4.

[7] *Ibid.*, pp. 6, 15-16.

[8] June Callwood, "School is for Nancy—But What About all Those Other Kids?" *Macleans*, January, 1967, pp. 16-17, 57-61.

[9] Wilbur B.Brookover and David Gottlieb, *A Sociology of Education* (New York: American Book Co., 1964), p. 71. For an interesting view of the circumstances in which the school can—and cannot—work changes in society, see Alan M.Thomas, "Studentship and Membership: A Study of Roles in Learning," *Journal of Educational Thought*, I (August, 1967), 65-76.

[10] Brookover and Gottleib, *op. cit.*, p. 69.

In our own geographical area, diversity has not always been so pronounced. The pioneer farmers who worked together to set up our earliest elementary schools were preoccupied with a desire to ensure basic literacy among children who were being brought up in a relative wilderness. To this end, some of the early settlers of Upper Canada were willing to endure a great deal of physical hardship and economic sacrifice. Until the early 1840's, they even seemed capable, in general, of disregarding religious differences in their attempt to erect a system of "common schools" in which their children could learn to read, write, and make simple calculations. The moral guidance given in these schools was of a simple, functional sort. Children were urged to develop characteristics generally considered to have survival value in this rather peculiar frontier community: diligence, thrift, respect for authority, and distrust of all persons and notions emanating from the United States.

In the mid-century period in which Egerton Ryerson was in control, elementary education was greatly expanded. With centralization under Ryerson came more adequate financing, compulsory attendance, organized teacher training and inspection, and the influx of educational ideas developed earlier in New England, Ireland, and Germany. However, the same period also witnessed the growth of religious strife. By the turn of the century, Ontario was in possession of a highly centralized educational machine of considerable efficiency. Although separated into two divisions along religious lines, the system was united by a desire to turn out, as economically as possible, a generation of literate, hard-working citizens firmly imbued with a love of the British Empire and a desire to succeed in a rural or small-town world.

The assumptions which guided the educational policymakers of those years have since been shaken by changing circumstances and by new ideas from many sources. To present an exhaustive list of these events and influences is obviously impossible. We can summarize, however, by saying that education in Ontario has partly absorbed some new attitudes to children, some new concepts of the role of the school, and some new views concerning the importance of inquiry.

A New View of Education

Influences on education in this part of Canada since 1900 have been many and varied. In a period in which there have been two world wars, heavy immigration, a major economic depression, two post-war decades of unexampled growth and technological development, and many new intellectual currents, it is difficult to isolate as "most important" any one event or set of ideas. To account for certain obvious changes in the objectives and characteristics of our schools, however, it is necessary to refer to the influence of John Dewey.

Dewey was sharply critical of the educational practice of the late nineteenth and early twentieth centuries. To put it simply, he believed that learning can only take place when an individual is interacting physically, socially, or symbolically with his environment. Dewey maintained that a child learns by experiencing his world in a concrete way and by putting his knowledge to immediate and frequent use. He insisted, moreover, that a child learns best when he is interested in what he is doing.

Dewey was certainly not the first educational theorist to draw attention to the child and his experiences or to the importance of the social environment. He did, however, present a theory of mass education which strove for a balance between the social values and individual values involved in the educational process—a balance which was peculiarly well adapted to the North American environment upon which it was to make its greatest impact.

Many of Dewey's earliest interpreters adopted a child-centred approach to education. His doctrine of interest was taken by some to mean that children should undertake only those tasks which interest them at the moment, and that conventional subjects should be abandoned. Later, in the Depression years of the 1930's, other interpreters of Dewey placed greater emphasis on the role of education in reshaping the values of a troubled society.[12]

Although some of the child-centred interpretations of Dewey were one-sided and extreme, the more moderate ones have had a marked and lasting influence on education in our century. First in a few "progressive" private schools in the United States and then in thousands of ordinary American public schools, elementary school children began to be seen as individuals with varying needs and capacities. Their patterns of development were carefully studied. Their physical and emotional well-being was considered. Curricula were revamped so as to capitalize on children's interests. In school systems with experimentally oriented administrators, "projects" partly or wholly replaced traditional subjects.

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[11] Norman Ayles, "Has Education an Aim?" *Researches and Studies*, XXVI (November, 1963), 14.

[12] There has seemed to be consensus among theorists that Dewey's ideas suffered from massive misinterpretation, and Dewey himself maintained in his later years that this was the case. For a contrasting view—one that places much of the responsibility upon conflicts inherent in Dewey's own thinking—see N.C.Bhattacharyya, "The Role of the Teacher in John Dewey's Educational Theory," *Alberta Journal of Educational Research*, XIII (March, 1967), 33-42.

In Canada, as one Canadian writer has remarked, "we have been prone to adopt the role of cautious observer of experiments carried out in the great laboratory to the south."[13] Although we have been sensitive to new ideas, we have seldom put aside our concern with "fundamentals" and sequential learning, even during periods in which child-centered and interest-centred ideas have been most influential. Nevertheless, many of Dewey's recommendations concerning the child are now well accepted in Canadian educational thought, and some of these are influencing the day-to-day practices of our schools.

The social side of Dewey's thought has also had some impact on Canadian education. Learning has come to be seen as a social activity–one which should involve co-operative effort among children. We now say that pupils should be encouraged to inquire actively together, rather than to sit silently absorbing prepared material in a sponge-like manner. In Canada the best-known example of socialized learning has been the "enterprise" method pioneered by Donalda Dickie in Alberta and Saskatchewan during the 1930's. Today, the effects of such movements may be seen in the degree to which there is "unit" organization in the curriculum[14] and in the extent to which the authoritarian atmosphere of the school has been modified.[15]

Throughout the years in which Canadian education has been slowly absorbing Deweyan ideas, other changes have been taking place. Our life, once predominantly rural, is now heavily urbanized. The family has relinquished many of its traditional functions. We are not only industrialized; we are on our way to being automated. Immigration has given us greater diversity. Mass communications have created a "global village" in which Canadians, along with many other peoples, are becoming immersed.

In the school, the concept of the first eight grades as adequate in themselves has vanished. We tend now toward the kindergarten-to-Grade 6 (K-6) rather than the K-8 elementary school, and we think of these early years as preparation for universal secondary schooling. Many new topics have appeared in the elementary school curriculum. Research has increased our knowledge of child development, individual differences, the learning process, appropriate teaching methods, and efficient administrative techniques. The child study and mental hygiene movements have had a profound effect upon teacher attitudes toward child behavior. The training of elementary school teachers, though still generally recognized as inadequate, has been improved. It is soon to undergo major deepening and expansion.

Recent Conflicts in Educational Thought

The picture presented so far is one of gradual change, taking place more or less in a single direction. To say that this change has occurred without difficulty would be an oversimplification. It is important, therefore, to add some account of conflicts which have crystallized during the past ten or fifteen years.

Deep-seated differences concerning educational policies came sharply to public attention in the late 1950's. The sudden flare-up of smoldering controversies was apparently touched off in 1957 by the shocked realization that the educational system of the Soviet Union, with its reputation for authoritarianism and subject-centredness, had in some respects out-produced the educational system of the United States. Soviet science and engineering graduates had accomplished a feat then beyond the capacity of Americans: they had launched an artificial satellite.

Looking back, in the light of subsequent American accomplishments in the space race, the near-panic of 1957 seems an extreme reaction. Nevertheless, this race has served as a dramatic backdrop for nearly a decade of public debate on education, much of which has been concerned with its underlying purposes. Canadians have, as usual, been interested spectators rather than leading participants. But the charges and counter-charges have sometimes hit home. In attacking "Deweyism" and "progressive education," critics like Professor Arthur Bestor of the University of Washington and Admiral Hyman Rickover of the United States Navy have challenged much that has been accepted by many of our own educators. And there are apparently a number of Canadians who are in sympathy with the attack.[16]

Much of the debate has been centred on differences of outlook among child-centred, society-centred, and subject-centred educators and parents.

To summarize a complex situation briefly, it would seem that some educators and some parents are convinced that "traditional" methods of education are superior to "progressive" ones; that some of the subjects more recently added to the curriculum are unnecessary; that most present-day schools offer "soft" education; that schools are undertaking more and more functions which are not, strictly speaking, educational; that college-bound students are often held back unjustifiably because of attention given to slower students.[17]

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[13] Joseph Katz (ed.), *Elementary Education in Canada* (Toronto: McGraw-Hill Co. of Canada Ltd., 1961), p. 10.

[14] *Ibid.*, p. 9.

[15] F.H. Johnson, "Changing Conceptions of Discipline and Pupil-Teacher Relations in Canadian Schools" (unpublished Ed. D. dissertation, Ontario College of Education, University of Toronto, 1952).

[16] See, for example, Hilda Neatby, *So Little for the Mind* (Toronto: Clarke, Irwin & Co. Ltd., 1952).

Currently, however, this debate seems to have faded into the background. For one thing, it has proved inconclusive, and there is a limit to the amount of attention the public will give to a controversy that seems to have no possible resolution. For another, it has been overshadowed by sub-debates. Those, for example, who believe that traditional subjects need greater emphasis are asked to take sides on another question. Should primary emphasis be given to the factual content of a subject or to its "big ideas" or characteristic mode of inquiry?[18] In addition, there have been a number of highly publicized developments in educational psychology. The names of the Swiss theorist Jean Piaget and those of Harvard's Jerome S.Bruner and B.F.Skinner are almost household words. Finally, the impact of automation on education is beginning to be felt.

New Complexities

The issues in elementary education today are complex. Many points of view are expressed. Here, in summary, is a brief account of a few of them.

1. *Concern for the Individual*

Critics who have been influenced (consciously or unconsciously) by present-day existentialism complain that the school fosters conformity to the commercial-industrial system that "asks the child to deny his own ego," leaving him with "no sense of himself left at all. . . ."[19] There are accusations that the relationship of teacher to pupil in Canadian schools is still basically master-slave, that the curriculum is irrelevant and useless—"the stately débris of a classical education . . . together with a hasty hodge-podge of maths and sciences alleged to suit the age of cybernetics."[20] It has even been suggested in a national magazine that "the Canadian school is a calamitous beginning for children of a democracy, which requires a citizenry of thinking, spirited people."[21]

What the child needs is freedom to be himself, says the British educational maverick, A.S.Neill. He urges that the school be made to fit the child, rather than vice versa.[22]

2. *The Role of the School in Social Change*

Ever since Plato, society-oriented theorists have maintained that the school can and should be a direct agent of social change. Others have insisted that education cannot be any such thing. "[They] have always postulated the dependence of education on the form of the social structure, regarding it as an 'adaptive' institution."[23] Still others, like the influential British thinker Karl Mannheim, have drawn on both traditions. What they see is more complex. For them, education is not "always and inevitably either the dependent or the independent variable in social change."[24]

Much contemporary thought recognizes that a school system is, in important ways, a reflection of the community which supports it. But our communities themselves are now caught up in a rising tide of change. Citizens are beginning to look to their schools for constructive action that will help break the cycle of poverty, stimulate productive life, and promote technological development. This point of view is lucidly presented by J.Bascom St.John, Chairman of the Ontario Department of Education's Policy and Development Council:

> *Education has always had two broad purposes, although this has not been apparent for very long.*
>
> *The older, and more generally understood, purpose has been the teaching of the primary skills of communication, mathematics and science. This purpose included the transmission of values and traditions developed or accepted by the family, group or nation at various places from historical times to the present.*
>
> *A more recent, and increasingly valid, purpose has been the inculcation of skills relating to economic activity in all its forms. It has been recognized that the standard of education in any country has a direct bearing on the productive capacity and technological attainment of its people. At this stage in human history, the importance of this latter function of education has been crucial.*[25]

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[17] Many philosophers and others are now critical of aspects of some key Deweyan tenets. A prominent example is Dewey's account of inquiry.

[18] Structural or "process" approaches are discussed in Chapter 4

[19] Norman Friedman, "The Schools and the Defeat of the Child," *Main Currents in Modern Thought*, XXIV (March-April, 1965), 85.

[20] Callwood, *op. cit.*, p. 16.

[21] *Ibid.*, p. 60

[22] A.S.Neill, *Summerhill. A Radical Approach to Child Rearing* (New York Hart Publishing Co., 1960), p. 4

[23] Jean Floud and A H Halsey, "Education and the Social Structure Theories and Methods," *Harvard Educational Review*, XXIX (Fall, 1959), 294

[24] *Ibid*. See also Thomas, *op. cit*

[25] Policy and Development Council, Ontario Department of Education, and Department of Educational Planning, Ontario Institute for Studies in Education, *Educational Planning Papers of the Invitational Conference* (Toronto, March 20-22, 1967), p 4

A variant of this view is that, in addition to its function as cultural transmitter, the school must now be changed so that it, in turn, may help change society. Its new function is that of reducing social "lag" in an era of rapid and profound technological advance.

> *It is all very well to regard our success in establishing control over our material environment as practically synonymous with human progress. But it is becoming increasingly obvious that social controls are an essential preventive of humanity's own self-destruction. It is also obvious that these controls have not yet been developed to a stage where our future is anything other than problematical.*[26]

3. The New View of Dewey

In spite of the success with which two generations of technically-minded philosophers have pointed out inconsistencies in Dewey's educational thought, much of what he wrote still seems relevant. Present-day exponents deny that Dewey's thought was in any way one-sided or extremist.

Dewey is being revived as a moderate. In a recent classification of theories in the journal *Educational Theory,* Dewey's views were placed in a middle left (not far left) position.[27] The writer distinguishes Dewey from the "progressives" who claimed to be his followers, pointing out that Dewey's approach was an attempt to reconcile extremist positions.

No less a contemporary philosopher than R.S.Peters has claimed that his own view of education is "not incompatible" with Dewey's stress on experience.[28] Dewey, he says, was not in any real sense hostile to the passing on of information, skills, and rules so long as this was not done in a rigid and unimaginative manner. Peters also sees little that was truly radical in Dewey's doctrine of interest or his emphasis on developing a critical habit of thought. Peters maintains that things can be interesting to a child either because they appeal to existing interests or because a teacher has made them seem appealing. He regards the notions of experimentation and critical discussion as fundamental traditions in our society—the traditions which insist that other traditions should not be taken for granted until they have been subjected to the test of experience.

Peters also believes that the apparent anti-intellectualism of some "progressives" was really only a complaint against the use of authority and drill in cultivating the intellect. It is perfectly possible, he suggests, to reach the same goals using methods which provide a startling contrast to the mindless memorization so prevalent in the past.

4. The Analyst and Educational Problems

Peters is one of a number of contemporary philosophers whose work illustrates the application of the analytic techniques of twentieth century philosophy to educational problems. Unlike many of their immediate predecessors, analytic philosophers of education do not attempt to extract "educational implications" from traditional philosophies. They try, instead, to subject educational arguments and the assumptions inherent in them to critical analysis. They also strive to clarify fundamental educational concepts like "mind," "equality of opportunity," "need," and "experience."

Today's philosophers of education are less involved in developing new doctrines or "philosophies" for education than they are in stimulating the educator's ability to think critically about problems that arise in the course of his work. The British analyst Paul Hirst describes his field as follows:

> *The term "philosophy of education" is perhaps best used to refer to the comprehensive contribution of distinctively philosophical methods of investigation to the discussion of problems that occur within educational theory.*
>
> *This means starting with questions about educational practice that occur within . . . [educational] theory. . . . There is indeed a pressing need for the development of philosophically informed educational principles [by directing] attention to philosophical questions that arise from specific educational issues.*[29]

Such a philosopher hopes ultimately to build a theory. To do this, he must co-operate with others whose special competences are in sociology, psychology, anthropology, and other behavioral disciplines relevant to educational problems. Progress is very gradual.

The Function of Broad Objectives

Committees and commissions of distinguished educators in the United States and Canada have frequently formulated statements of objectives. Typical are those issued periodically by the

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[26] W G Fleming, "Rational Strategies for Educational Change," *Emerging Strategies and Structures for Educational Change* (Toronto: Ontario Institute for Studies in Education, 1966), p. 23.

[27] Hugh C Black, "A Four-Fold Classification of Educational Theories," *Educational Theory,* XVI (July, 1966), 281-291.

[28] Peters, *op. cit.,* p. 99.

[29] Paul H.Hirst, "Philosophy and Educational Theory," *Philosophy and Education,* ed. Israel Scheffler (2nd.ed.; Boston: Allyn and Bacon, Inc., 1966), pp. 94-95.

National Education Association's Educational Policies Commission and the report prepared after the White House Conference on Children and Youth in 1960. Some psychologists have attempted the same sort of thing in listing a child's "developmental tasks." In Ontario, parts of the Hope Report (1950) offer an example of the same sort of enterprise, as do the statements of local school board aims mentioned earlier in this Chapter.[30]

In spite of assertions that broad generalities about educational objectives are meaningless, most people who work in education seem to act as though general objectives did have some kind of a function. What is this function?

Two American philosophers of education, B.Paul Komisar and James E.McClelland, have devised an ingenious answer. Komisar and McClelland have suggested that statements about the "aims of education" perform a legitimate function in educational discourse but that this function is a *ceremonial* one.[31] In a convocation speech, for example, it is appropriate to use phrases like "democracy in the classroom" or "return to fundamentals" to arouse enthusiasm or for some other emotive purpose. Such expressions are actually slogans—that is, pronouncements which do not refer to particular events but which are nevertheless useful—and clearly understood—in such situations.

Difficulties arise, however, when educational slogans are used in non-ceremonial ways—in attempts to convey information or to give direction to educational activities. This is when they are likely to be misunderstood and to give rise to confusion. Such slogan-statements sound like generalizations. But, unlike generalizations, they do not logically imply a definite set of particulars. Also, they are "systematically ambiguous"—that is, they permit a wide variety of proposals, some of which may be incompatible with others.

But Komisar and McClelland say that slogans may acquire a "legitimate" non-ceremonial role. All that is necessary is that a slogan be given an interpretation which arbitrarily restricts its application to a limited set of proposals. An educator gives an aim a "legitimate" function whenever he spells out to some extent what he means when he states it. When he combines one explicated slogan with others in such a way as to unify a number of various proposals for education, he has developed a "slogan system" or "philosophy of education." (Being arbitrary, here, does not mean presenting views that cannot be defended or justified. It only means stating ideas that exclude other ideas.)

It may be that such analyses as that of Komisar and McClelland will be very helpful indeed.
Until recently, it probably did not matter, in many cases, whether trustees, administrators, and teachers were especially clear-headed about what they were trying to do, since they often did not know how to go about doing it. This situation, however, has changed and seems likely to change even more radically. New educational techniques and technologies are beginning now, for the first time, to make it possible for educators to realize a broad spectrum of objectives and to determine by means of tests at what point and to what degree these objectives have been reached. The prime requirement is that the educator be able to state his goals in a specific way. Yet it is at this precise time that many educators have seen the difficulties inherent in attempts to elicit "implications" for education from the philosophical systems of the past. And it is also at this time that many have seen the limitations of broadly stated objectives in the absence of deliberate efforts to clothe them with significance.

Our suggestion, then, is not that broad statements of educational objectives be abandoned. It is rather that they be seen for what they are or may be: (1) ceremonial utterances, (2) statements which direct attention to aspects of education which a speaker believes are being neglected, (3) statements which, taken *en masse,* can provide a sort of formal outline or structure into which specific middle-level content can be poured, and (4) statements issued by a public authority as a very general guide to the professionals it employs.

Because the first two of these four functions have already been described, they will not be given any further elaboration at this point. The third and fourth functions, however, will require a little explanation.

Function (3) brings us to a consideration of what is contained in broad statements of objectives. Robert M.Gagné of the American Institutes for Research has recently suggested that the broad goals of education, as defined by such organizations as the National Education Association (1964), the Rockefeller Brothers' Fund (1958), and the President's Commission on National Goals (1960), are characterized by three main emphases:

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[30] See p 7

[31] B Paul Komisar and James E.McClelland, "The Logic of Slogans," *Language and Concepts in Education* (Chicago: Rand McNally & Co., 1961), pp 200-214

1. Education has the purpose of making it possible for the individual to participate in and to share with other people a variety of aesthetic experiences.
2. A second major goal is the development of responsible citizenship.
3. The development of individual talents to the end of achieving satisfaction in a life work or vocation is a third goal.[32]

In his third point, Gagné intends vocational goals to be interpreted broadly. Under this heading he deals with all subjects through which schools "attempt to provide the individual with ever-increasing power to deal with and master his environment—the kind of instruction which we think of as including such subjects as English and mathematics and languages and science."[33]

Hazel Lambert, the author of a popular book on elementary education, has seized upon a similar formal structure:

Should [*the educator's guide*] *be found in the organized areas of subject-matter, in the structure of society, or in the nature of the developing child?*
Each provides a framework in which the child can be educated, but none is sufficient by itself.
They are all important and the best solution is to utilize all referents that have some bearing on education in a democracy.[34]

What Lambert points to is not a set of objectives but rather a list of categories according to which existing statements of objectives can be organized. These categories are (1) concern for the individual, (2) concern for society, and (3) concern for knowledge as organized into subjects. Specific programs which promote one type or category of objective at the expense of another should, at the very least, be carefully re-examined.

Function (4) is well illustrated in the submission of the Scarborough Board of Education to the Hall Committee. In it the Board recommends "a two level approach to curriculum definition":

An expression of desirable educational objectives by the community's representatives.

An expression of how these objectives may be met by the teaching profession.[35]

What the Board members are proposing is that the formation of broad general objectives be their function as elected representatives of the community, and that the creation of goals on the middle and lower levels be the task of their professional employees. This means, at a minimum, that programs proposed by professionals must not be designed to frustrate the Board's—or the Department's—general objectives. (An example would be setting out to prepare Ontario pupils for life in a Fascist society.)
Beyond this, the main requirement will be for school programs which consist of elements the professionals believe will help realize the goals set forth by the Board and the Department.[36]

The Development of Specific Objectives

The educator who faces the task of formulating objectives at the middle level is subject to many pressures. He has no doubt about the value of knowledge. But what *kind* of knowledge is he to encourage children to seek? If he decides that the desirable kind of knowledge is *useful* knowledge, he must still distinguish between that which is primarily useful to society and that which is primarily useful to the individual.[37] Society needs persons who are skilled and persons who have been successfully enculturated—that is, effectively introduced to the traditional values of the community.
But the individual also has his own needs for knowledge. If he is to be an educated person, the child needs the kind of schooling which will make him both informed and critical.[38] Schooling which fails to take account of any one of these factors will not satisfy the fundamental criteria inherent in publicly acceptable statements about education.
As we have seen, the educator cannot directly *deduce* his working objectives from the general ones that he is given. Instead, he must develop them gradually while dealing thoughtfully with the daily problems of his job.[39] Certainly this has been the case with school administrators who have developed programs

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[32] Robert Gagné, "Educational Objectives and Human Performance," *Learning and the Educational Process*, ed. J.D.Krumboltz (Chicago: Rand, McNally & Co., 1965), pp. 2-3.

[33] *Ibid.*, p. 3

[34] Hazel Lambert, *Elementary Education* (Washington: The Center for Applied Research in Education, Inc., 1963), pp. 15-16.

[35] Submission to the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario, December 19, 1966, from The Board of Education for the Township of Scarborough, p. 1.

[36] *Ibid.*

[37] Marcus Long, "The Folly of Teaching," *Toronto Education Quarterly*, VII (Autumn, 1967), p. 8.

[38] *Ibid.*, pp. 9-11.

[39] Some interesting suggestions as to ways in which this may be accomplished are contained in William K.Frankena, *Philosophy of Education* (New York: Macmillan Co., 1965), pp. 7-10. See also W.G.Fleming, *op. cit.*, pp. 20-21, 29-31.

aimed at compensating for the effects of poverty, at individualizing instruction, at eliminating grade barriers, or at making better use of teacher time and talent—the kinds of programs, in fact, with which we shall be greatly concerned in this Report.

Once equipped with a program composed of some such middle-range objectives, the educator's next tasks are to specify in detail what he means by these and to develop ways of measuring progress toward them. At the same time, he will be setting up lower-level goals, each of which will promote the middle-range objective in a specific way. Finally, he will seek ways of measuring progress toward his lowest range of goals.

Only when the elementary school child is presented with carefully articulated steps leading to specified objectives can his schooling proceed in an orderly manner toward clear-cut goals. Only with clear-cut goals can our schools give a confident welcome to the technology which will help to ensure fulfilment of their objectives. Certainly it is those educators who have developed coherent goals who can make the most valuable contribution to the planning of buildings which must accommodate the educational efforts of the future.

Conclusion

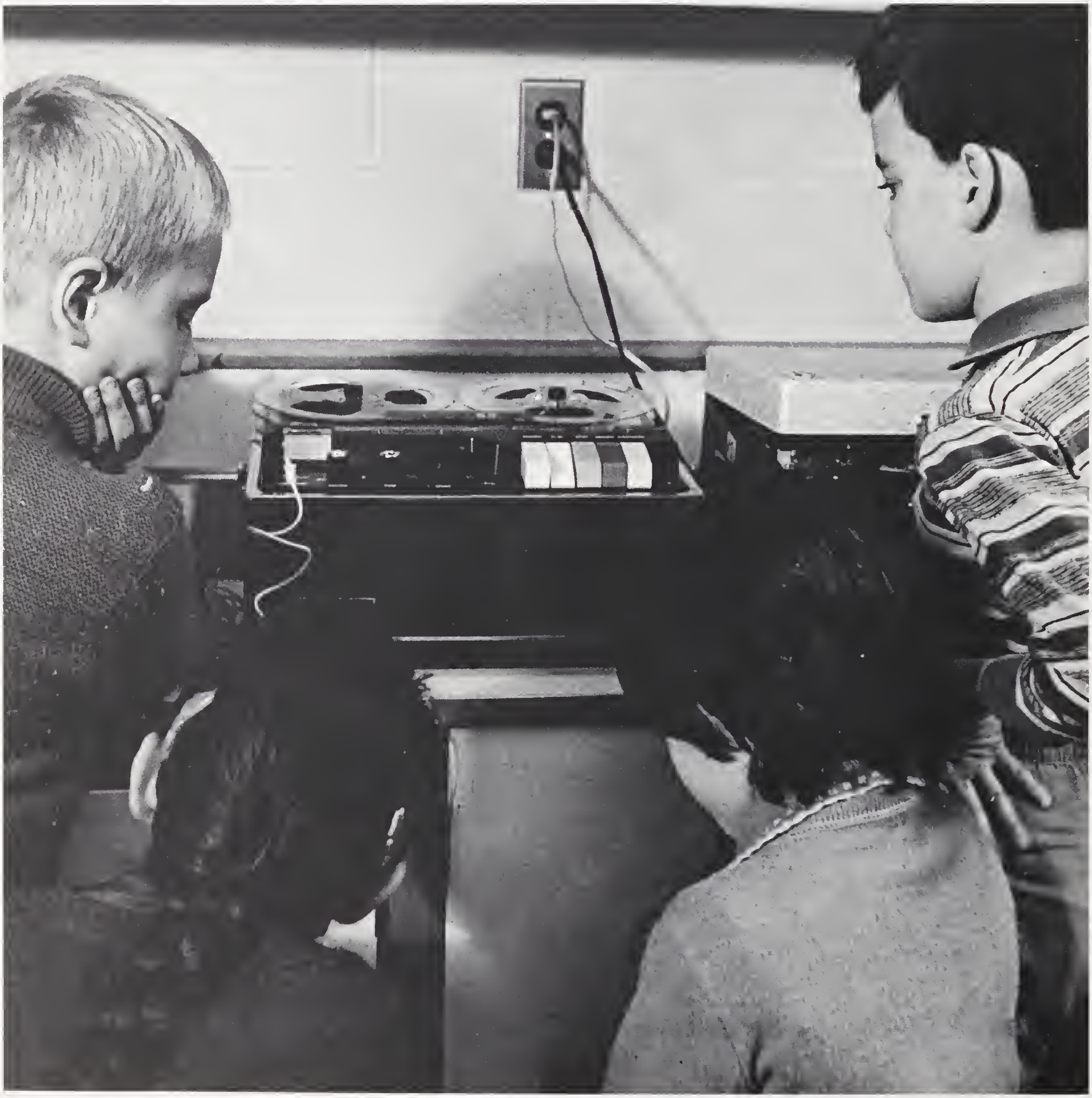
Earlier in this Chapter, we listed some of the changes that have occurred over the years in our society and in our elementary schools. We did not, however, single out what may well be the most significant alteration of all. This is the change in the *rate* of change which is causing concern about the value, for tomorrow's world, of what is being taught today.

Elementary teachers in pioneer days assumed, correctly, that most of what was taught would remain relevant throughout pupils' lifetimes. Today's teachers cannot be so confident. What about some of the "facts" in the social studies course? The explanations in science class? How long will they remain true? What about the way values are interpreted? How long will it remain relevant?

Similar problems confront the planners of school facilities. Yesterday the validity of graded organization was assumed. Schools were therefore composed mainly of enclosed spaces, each accommodating one teacher and 30 to 35 pupils. Today, many educators see graded organization as an impediment to learning. Therefore, they want buildings which will accommodate teacher-pupil groupings of many different kinds. To the extent that they see knowledge as something pupils seek for themselves, educators are interested in having centres in which children can use a variety of today's media in searching independently for an understanding of their world. The problems, viewpoints, and insights of the educators of 2,000 A.D. are an interesting subject for speculation. While it seems possible to make some predictions, we certainly cannot be sure that our current notions about their educational situation will prove accurate. Some of their goals and some of their methods will probably be very different from ours, but it is hard to say in precisely what ways they will be different.

To plan for today and tomorrow, then, we need an understanding of our society's and our locality's major problems, a knowledge of ways in which the likelihood of learning is increased, and an appreciation of the unlikelihood of particular policy decisions having permanent validity. We also need a set of value judgments (clearly labelled as such) concerning what and by what methods our children should be encouraged to learn at this time.
It is to be hoped that, within such a frame of reference, we shall be able to plan facilities for the present that will not unnecessarily restrict resolution of future educational problems.

To learn effectively, a child must be involved in pursuits which are meaningful to him *and which afford him likelihood of a continuing sense of success and achievement.*



Huron Street Public School, Toronto

Photo by Michael Spivak

Chapter 2
Learning and Learners

As we look around the world, we recognize that the human being can learn to behave in almost any way.[1]

In the above quotation, sociologists Brookover and Gottleib are stating the obvious about the human race. Humans adapt their environment to suit their own purposes. Through exploitation of the learning process they pass on the knowledge and skills involved in this adaptation. Sociologists, like laymen, tend to take a rather commonsense, even casual view of learning:

> *In most life situations learning is not much of a problem. . . . Throughout human history people have learned, and in most cases without troubling themselves as to the nature of the process.*[2]

Psychologists and educators cannot be satisfied with this. They want to know what is going on while people are learning, and what conditions are associated with specific kinds of learning by different kinds of learners. Out of their investigations they formulate, from time to time, new and more complete pictures of the learning process—theories which (it is hoped) will serve as keys to the improvement of teaching.

There are times when this hope seems slender. According to Professor David Ausubel of the Ontario Institute for Studies in Education, there is a good deal of doubt among educators, learning theorists, and educational psychologists as to "the relevance of learning theory for pedagogy."[3] Much of this concern about the connection between learning theory and classroom practice, according to Ausubel, is the result of a "serious decline in . . . theorizing about school learning. . . ."[4] Experimental psychologists working outside education have concentrated on animal studies or investigations of the simplest forms of human learning. Educational psychologists have, in general, "failed to conduct the necessary applied research, and have succumbed to the temptation of extrapolating the theories and findings of their experimental colleagues to classroom learning."[5]

Ausubel suggests that there should be a concerted attempt to develop viable "classroom learning theory," which he defines as "general principles of facilitating school learning."[6]

> *There is, surely, a very close relationship between knowing how a pupil learns, and knowing what to do to help him learn better. . . . It would seem reasonable, therefore, to suppose that the discovery of the most effective methods of manipulating learning processes would be dependent upon and related to our accurate understanding of these processes.*[7]

In spite of the unfortunate state of classroom learning theory at present, we are not entirely without knowledge concerning human learning in a more generalized sense. But even in this broader area, experts disagree with one another to a very serious extent. Ernest R.Hilgard, the author of a standard and well respected textbook for students of learning theory, describes the situation as follows:

> *The student of learning, conscientiously trying to understand learning phenomena and the laws regulating them, is likely to despair of finding a secure position . . . [since] no one has succeeded in providing a system invulnerable to criticism. The construction of a fully satisfactory theory of learning is likely to remain for a long time an uncompleted task.*[8]

Because many reviews of current learning theory are available—and because most of these, in any case, must lead the reader to Hilgard's conclusion—it would be redundant to present such a summation in this Report. What we shall attempt, as an alternative, in the following pages is to walk a narrow line between saying too little and saying too much, between a vapid eclecticism and an ill-founded dogmatism. We shall offer, instead, a widely accepted definition of learning plus a series of rather simple statements about human learning which also appear to enjoy broad acceptance.

Defining and Characterizing the Learning Process

Hilgard[9] points out that it is not easy to formulate a really good definition of learning. We say we are learning when we are memorizing French vocabulary or acquiring a skill such as typewriting. But it is clear, on reflection, that we are also learning when we are developing a prejudice or an ideal, when we are feeling our way toward a new social skill, even when we are merely acquiring a new tic or mannerism.[10] Hilgard offers, as a provisional definition, the following:

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[1] Wilbur B Brookover and David Gottleib, *A Sociology of Education* (New York. American Book Co., 1964), p. 29.

[2] Morris L.Bigge, *Learning Theories for Teachers* (New York: Harper and Row, 1964), p 3.

[3] David P Ausubel, *Learning Theory and Classroom Practice* (Bulletin No 1, Toronto Ontario Institute for Studies in Education, 1967), p. 1.

[4] *Ibid*, p 2.

[5] *Ibid.*, pp. 2-3.

[6] *Ibid.*, p. 4.

[7] *Ibid*

[8] Ernest R.Hilgard, *Theories of Learning* (New York. Appleton, Century, Crofts, Inc., 1956), pp 13-14

[9] *Ibid.*, p. 6

Learning is the process by which an activity originates or is changed through reacting to an encountered situation, provided that the characteristics of the change in activity cannot be explained on the basis of native response tendencies, maturation, or temporary states of the organism (e.g. fatigue, drugs, etc.).[11]

Though, as he himself points out, Hilgard's definition contains many undefined terms, it would probably not be a source of controversy in a gathering of learning theorists. Their disputes, as he notes,[12] are typically centred on fact and interpretation rather than on definition.

What, then, are some of the best accepted generalizations about human learning?

1. Learning is Natural

A great deal of learning goes on in the absence of any attempt to promote it. The young child learns the language spoken in his home in a seemingly effortless manner. There is seldom direct intervention by adults. Young humans learn a great deal in similar ways from the environment in which they grow up. Dewey[13] emphasized the naturalness of learning when he drew attention to the fact that learning happens with experience (direct or indirect)—that is, while the child is interacting with his environment, while he is participating in the ongoing stream of events. The naturalness of learning and the importance of involvement were also clearly recognized early in this century by the Italian educator, Maria Montessori.[14] Similar notions concerning naturalness have recently been put forward by Marshall McLuhan.[15]

2. Learning is Accumulative

Traditional schooling was based on the maxim "practice makes perfect," and massive amounts of evidence from the stimulus-response family of learning theorists (Hull, Spence, Skinner, and many others) support this approach. Programmed instruction (and, therefore, computer-assisted instruction) is based on the notion that new bits of learning are serially integrated with existing bits. Denial of the accumulative nature of learning is akin to denial of the continuity of human experience. It is obvious that a child gradually learns more and more about Batman, even though he is exposed to the Batman series for only two half-hour periods a week. What is learned in a particular program is incorporated into what was previously known. The child does not start with a new Batman in each program; he adds the new learning to what he has already accumulated.

3. Learning is Unified

An individual cannot acquire new information without in some sense making it a part of his own personal world. His world is unified in the sense that it has been constructed and is continuously being reconstructed by him out of his own experiences.

Some educators show their awareness of the unity of learning when they admonish one another to pay attention to "the whole child"—not to his marks alone, or his family, or his mannerisms, or his IQ, or some mechanical summation of these—but the whole child. This principle is also taken into account by those who stress careful attention to the matrix into which the child must integrate each new piece of information. As Ausubel puts it,

Cognitive theory regards the human nervous system as a data-processing and storing mechanism so constructed that new ideas and information can be meaningfully learned and retained only to the extent that they are relatable to already available concepts or propositions which provide ideational anchorage.[16]

Finally, the same principle is invoked by those who emphasize that the child must organize his behavior in a particular situation in a number of ways. He must, as we have seen, relate any new information to what he already has learned. He can accept it only within the context of other simultaneous events. He must interpret it, partially, in terms of his expectations of the future.

Some recent research concerning the nature of this complex unity has been conducted by Professor Milton Rokeach of Michigan State University. Rokeach[17] postulates that the *manner* in which an individual's beliefs are held will affect his behavior at least as significantly as will the actual *content* of his beliefs. Closed-minded or dogmatic persons hold their beliefs in a manner which differs markedly from the way in which open-minded persons hold theirs. Moreover, there are differences in the centrality or importance assigned by various individuals to particular beliefs. There are also differences in the extent to which specific notions are part of an interrelated system of beliefs. Finally, there are differences in the certainty which the holder ascribes to particular beliefs. While the implications of this theory for education have not as yet been fully elaborated, it seems likely that hypotheses contained in it may soon provide a theoretical framework for some new and interesting work.

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[10] *Ibid.*, p. 2.

[11] *Ibid.*, p. 3.

[12] *Ibid.*, p. 6.

[13] John Dewey, *Experience and Education* (New York: Macmillan Co., 1938).

[14] Maria Montessori, *Spontaneous Activity in Education* (Cambridge, Mass.: Robert Bentley Inc., 1917).

[15] Marshall McLuhan and George B.Leonard, "The Future of Education," *Look*, February 21, 1967, p. 23.

[16] Ausubel, *op. cit.*, pp. 10-11.

[17] Milton Rokeach, *The Open and Closed Mind* (New York: Basic Books, 1960).

4. Learning is Selective

People do not experience consciously most of the stimuli which impinge upon them. The sound of the typewriter at the next desk, the purr of an automobile engine while we are driving may go unnoticed on the conscious level. What we do experience consciously depends in part on what we choose to perceive—that is, on what we select.

Another type of selectivity, as we have seen, is that which comes as part of the effort to make new experiences comprehensible in the light of old experiences, simultaneous experiences, and expectations for the future. Students of perception have long been familiar with the psychological phenomenon of closure. Incomplete drawings, for example, are perceived as complete, through a process of ignoring the missing portions or filling them in out of past experience. Apparently we accept new learning in such a way as to minimize disruption of our existing belief system.

Selectivity in retention has also been documented. For example, people generally retain pleasant memories longer than unpleasant ones.

Our behavior when we are learning, then, has at least four selective aspects. We select when we are determining what we will pay attention to, when we are identifying and recognizing new stimuli, when we are incorporating new information with previous learnings, and when we are remembering things we have learned at an earlier time.

5. Learning is Individual

To say that learning is individual, or personal-subjective, is not to say that it is non-social. Like all other forms of human activity, learning involves, reflects, or stems from interaction with other people.[18] Nevertheless, it is only when personal learning takes place that we can infer that group or collective learning is occurring.

Educators acknowledge this characteristic of learning when they speak of individual differences. The well-known American researcher Benjamin Bloom[19] has considered children's intellectual and academic development and the school's capability for furthering them. His analysis of studies of identical twins brought up in radically different environments has indicated that there might be a difference in IQ up to 20 points if one twin's environment were highly nutritious to his intelligence and emotional life while the other twin's environment was disadvantaged.

Despite the fact that learning, like all other human activity, has a strong social dimension, there has in recent years been a marked increase in interest, among educators, in the individual as a learner. Although a child is always learning, he may not be learning what his teacher supposes she is teaching him, for a child learns in relation to his own peculiar complex of personal attributes and experiences. Age, sex, interests, physical growth, emotional stability, innate talents or disabilities, constitutional factors, interpersonal relations, social class, home environment, language, and feeling of personal worth all have an important bearing upon the degree and quality of an individual's capacity to learn. To learn effectively, a child must be involved in pursuits which are meaningful to him and which afford him likelihood of a continuing sense of success and achievement.

While the individuality of learning is obvious in particular skills such as swimming or reading, it is more difficult to document in the attitude or value area. However, there seems little doubt that each child defines for himself such concepts as criticism, fear, praise, justice, and honesty and develops his own meanings for fight, hate, and love.

Learning in Elementary Schools

The children who attend the elementary (K-6) school have certain characteristics as learners. First and most obviously, their ages generally range from five to twelve. For most of them, the elementary school provides their first contact with formal education. (A few have spent some time in nursery schools.) While most twelve-year-old children differ in many obvious ways from most five-year-old children, certain general statements can be made about children in this age range, so long as it is appreciated that these statements apply in differing degrees across the range.

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[18] Glenn M.Vernon, *Human Interaction: An Introduction to Sociology* (New York: The Ronald Press, 1965), p. 4.

[19] Benjamin Bloom, *Stability and Change in Human Characteristics* (New York: John Wiley and Sons, Inc., 1964).

1. General Characteristics of K-6 Children

A most obvious characteristic of K-6 children is related to their stage of physical development. They are simply smaller than and not as strong as older children. A second easily observable characteristic is their high level of physical activity. They move and jump and run with little or no provocation. They indulge in a variety of games involving physical activity. While they lack the stamina of older children, they engage energetically and recover quickly from fatigue or minor injury.

Children of this age generally exhibit acute perceptions. They see, hear, smell, taste, and feel stimuli that younger children miss and that most children of twelve-plus have learned to ignore. Children at the younger end of this age range are multi-sensory, while perceptual biases (e.g., visual orientation in the McLuhan sense) are generally well established by about ten or twelve. These children are curious. However, this characteristic diminishes drastically during this period. Their interests are diverse; their attention spans are of variable duration—generally very short among the younger members of the group.

K-6 children display some social characteristics which are superficially in opposition to one another. They are both self-centred and imitative, for example. Their egotism takes the form of overt demands for attention. In seeking notice they are alert to the behavior of others and quick to note the evaluations received. When the behavior of others is seen to attract notice, it is readily imitated. The tendency to imitate peers (in dress, speech, and mannerisms) is intensified as children progress through this age range. The strong self-centredness generally decreases in its more overt forms as the child learns to co-operate more effectively and continuously with others. This co-operative activity is most apparent in the groups (gangs) formed by children of this age.

2. Differences among K-6 Children

Each of the children we are considering is a unique and variable person. He is not only unlike any other child; he is unlike himself as he was a year ago or a month ago; he is in a process of instantaneous and continuous fluctuation and change.

The concept of individual differences is well known to educators. A recent California publication[20] has suggested that there are three major areas of individual differences:
inter-individual, extra-individual, and intra-individual.

a. Inter-individual differences

This term is used to describe measurable differences among individuals. These include variations in weight, color, perceptual abilities, socio-economic class, sex, birth order, religion, IQ, ethnic background, and experience. Any or all of these (or other) variables may be related to what, how, how well, and when the child learns.

b. Extra-individual differences

This term is used to describe the variability among individuals in responses to the same external stimuli. This variability means that the impact of the external world is different for different individuals.
A reprimand that crushes one child leaves another apparently unscathed. A room temperature comfortable for one may be uncomfortable for another. A story that excites one is a bore to another. A gesture that indicates sympathy to one reveals weakness to another. A test is a major crisis to one child, merely a routine event to another. An event that distracts one child will scarcely be noticed by another. People—and K-6 children are people—differ in the ways in which they allow the environment to impinge upon them. This means that the search for a standard ideal environment for learning is futile. Inevitably, an environment which is optimal for some learners will be less than ideal for others.

c. Intra-individual differences

This term is used to describe differences within an individual from time to time, from situation to situation, from activity to activity. An individual may perform differently at 9:00 a.m. than at 2:00 p.m., in mathematics than in history, in the classroom than on the playground, in soccer than in hockey, in hearing than in seeing.

d. The uniqueness of individuals

This account of differences, while in no way exhaustive, illustrates the extent to which each individual is unique. The relevance of these differences to learning is well known to classroom teachers. They indicate this when they say that it is essential in teaching to "understand the child."

Obviously, the inter-individual differences involved are not extreme for most of the population. Clearly, too, the intra-individual differences are something that the child becomes increasingly capable of handling as he proceeds through the age range. Finally, it is apparent that some of the tasks prescribed by society for the K-6 school are designed to help the child to cope with environmental demands and thus gradually to minimize the extent of extra-individual differences. Nevertheless, optimal conditions for learning can be achieved only where *all* types of individual differences are taken into account, to whatever degree is necessary for each child.

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[20] Institute for Development of Educational Activities, Research and Development Division, *Changing Schools*, I (December, 1966), p. 2.

3. Criticisms of Learning in Elementary Schools

Schools are environments deliberately created to promote learning—or, at least, to promote the kinds of learning deemed desirable by society. In a pluralistic society such as North America, it is inevitable that there will be conflict among rival philosophies and that representatives of these various opinions will all be anxious to influence education. With this the schools have somehow learned to live, but now they are confronted as well with new pressures. These are a consequence of the fact that the pace of change is more rapid than ever before, and they are an added complication to which the schools are finding it difficult to adapt.

New knowledge about learning, for example, makes little immediate impact on the day-to-day business of the schools. It would almost seem, instead, that schools accommodate themselves to new learning theories simply by layering them on top of previously held ones.[21]

Failure to adapt to the pace of new knowledge and to social change is only one of the complaints directed at the schools. Many of today's critics maintain, much as Dewey did, that there is an artificial and harmful discontinuity between learning in general and learning in schools:

> *The job of education as the maintainer of society and the developer of individuals is to discover values and experiences that need to be assimilated from all parts of community life, and to seek, create, and intervene in the processes of interdependence among all the people in the community. The process of discovering is not something apart from the process of invention. Education is an aspect of life, and in the largest sense every man with a purpose is to some extent both a teacher and a student.*[22]

Recently a number of people have made extremely critical statements about learning in schools. Social critic Paul Goodman,[23] sociologist Edgar Z. Friedenberg,[24] teacher-writer John Holt,[25] and some of the contributors to a new Toronto publication entitled *This Magazine is About Schools* are examples. Taken as a group, these writers seem to be saying that the learning that takes place in schools is not that which should take place there and is, in fact, often opposite to that which is desirable. The basic point of these critics seems to be that schools, in their present institutional form, ignore or deny certain inherent characteristics of learning.

Some specific charges are

(a) that the "sit-and-listen-and-do-what-you're-asked" approach denies the naturalness, or the participatory characteristic of learning,
(b) that the grade structure denies the continuity of learning,
(c) that the conventional "subject" approach denies the unity of learning,
(d) that rigid timetabling denies the selective aspect of learning,
(e) that the standard class size denies the individuality of learning.

Respected scholars in many different disciplines have also expressed varying degrees of concern about the ways in which pupils are studying particular subjects.

Carl Rogers,[26] the psychologist, has warned that in a time when knowledge is increasing rapidly, genuinely creative adaptations seem to represent the only possible strategy that man can use in keeping abreast of the kaleidoscopic changes in his world. A passive and culture-bound people cannot cope with multiplying issues and problems. He suggests that unless we learn to make new and original adaptations our civilization may perish.

Erich Fromm,[27] the psychiatrist, has also warned us about conformity. He sees conformity as a hidden risk to democracy if too many individuals cease to be themselves and adopt the kind of personality imposed on them by cultural patterns.

Robert Theobald, a New York economist, stated at a recent conference in London, Ontario that, in his opinion, schools are "obsolete and harmful." He claims that technology has made classrooms out of date, and that children are "suppressed and repressed" by being placed in a situation in which one adult must deal with 30 pupils. Teachers in such situations are forced to demand passivity and conformity, says Theobald. He has predicted that the school as we know it will wither away. He suggests that it "should be replaced by small groups of young people studying together with non-authoritarian teachers, preferably with access to a computer."[28]

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[21] Bigge, *loc. cit.*

[22] H.Thalen, *Education and the Human Quest* (New York. Harper and Row, 1960), p. 218.

[23] Paul Goodman, *Compulsory Miseducation* (New York: Horizon Press, 1964).

[24] Edgar Z.Friedenberg, *Coming of Age in America* (New York: Random House, 1965).

[25] John Holt, *How Children Fail* (New York: Pitman and Co., 1964).

[26] Carl Rogers, *On Becoming a Person* (Boston: Houghton, Mifflin & Co., 1961).

[27] Erich Fromm, *Man for Himself* (New York. Holt, Rinehart and Winston, 1947).

The need for change has also been recognized by the Ontario Department of Education, as well as by associations of trustees, parents, and teachers. Dr.R.W.B.Jackson, Director of the Ontario Institute for Studies in Education, stresses Ontario's readiness for change "in terms of deliberate and conscious planning for alterations in the educational structure and processes."[29] And Professor W.G.Fleming of the Institute adds to this on a hopeful note:

> *Fortunately there is strong evidence of increased professional concern about the large gap between what is known about good educational theory and practice and what is actually happening in the schools.*[30]

To judge from the educational literature of the past few years, there would seem to be widespread realization among educators that there is a need for more research and more appropriate research, and that there is also a need for application in the schools of understandings already in the possession of researchers.

Major Proposals

So far, we have considered *what learning is*, in so far as this is presently understood. We have defined learning—though not exhaustively—as something which comes naturally to humans, and as something which is accumulative, unified, selective, and individual. Turning to the elementary school, we have considered some of the physical and psychological characteristics of the children who attend it. We have also noted the views of some educational critics who believe that much of what goes on in our elementary schools has a tendency to frustrate, rather than to promote, the process of learning among these children. Finally, we have seen that in our own province there now appears to be a climate which ensures a favorable hearing for proposals concerning constructive changes in the educational system.

To list all the changes which have recently been proposed would be impossible in this space, even if this were considered to be desirable. It is relatively easy, however, to name a number of seriously urged proposals each of which exhibits some close connection with present-day understandings about the learning process. It is recognized that there is not one among all these proposals for reform which is not interconnected in some important way with each of the others. Some, indeed, may be partly defined in terms of others. Nevertheless, the sheer complexity of the situation demands the adoption of some convenient, if arbitrary, way of breaking down these concepts and relating them to a learning-theory basis. It is with these qualifications in mind that we offer the following analysis.

1. Continuous Progress

Because we know that learning is accumulative, with each new bit of learning connected with others, it follows quite obviously that *nothing in the educational system should prevent a child from learning at the precise time that he is ready to do so*. To hold a child back in arithmetic on the ground that he is not doing well in English is one common violation of this principle—a violation that is built solidly and seemingly inescapably into many examples of the graded school system.

The presence of a rigidly graded structure has been taken for granted in North American urban education since about the middle of the nineteenth century. One way of defining it is as a procedure of grouping beginners according to chronological age and then moving them from lower to higher groups at fixed and rather lengthy time-intervals in accordance with the results of achievement tests. A more concise definition might be grouping "in accordance with . . . ability to meet . . . standards."[31]

The desirability of the graded structure in elementary schools has been seriously challenged on many occasions.[32] One of the most significant of these has been the appearance of a book entitled *The Non-graded Elementary School* by John Goodlad of the University of California and Robert Anderson of Harvard. Since its publication the idea of nongrading has attracted an increasing amount of support. The following is a summary of the Canadian situation in 1967:

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[28] "Schools and Universities Obsolete, Should be Abolished, U.S. Economist Says," *Globe and Mail*, April 10, 1967.

[29] Ontario Institute for Studies in Education, *Emerging Strategies and Structures for Educational Change*, Proceedings of the Anniversary Invitational Conference, June 12-15, 1966 (Toronto: Ontario Institute for Studies in Education, 1966), p. 134.

[30] *Ibid.*, p. 24.

[31] Donald C.Cushenberry, "Two Methods of Grouping for Reading Instruction," *Elementary School Journal*, LXVI (February, 1966), 267.

[32] John I.Goodlad, "Classroom Organization," *Encyclopedia of Educational Research*, ed. Chester W.Harris, 3d. ed. (1960), 222.

1. Saskatchewan and Québec appear to be on the leading edge of a movement toward a non-graded form of organization for elementary schools.
2. Several provinces will likely follow this example.
3. The non-graded approach in Canada has been limited to the elementary school level. Subject promotion at the high school level appears to be gaining in popularity.[33]

It has recently been estimated[34] that 26 per cent of the schools in the United States are involved in some variation of the continuous progress plan.

Professor Robert F. Carbone of the University of Wisconsin distinguishes the theory of continuous progress from both the "grade standard theory" and the "continuous promotion theory."[35] The former lies behind what is often referred to as "lock-step" grading. The latter, says Carbone, is "a by-product of the so-called progressive movement . . . which encourages automatic promotion of all pupils based on the criterion of chronological age." The "theory of continuous progress," by contrast, asserts that the curriculum "must be adjusted to the unique learning pattern of each pupil, thus making possible the continuous and independent movement of each pupil through a school program."[36]

Carbone defines a nongraded school as one concerning which the following statements are true:

(a) Sequential instructional goals for all subjects are explicitly stated in detail, in behavioral terms, and in relation to subject matter—i.e., in terms of knowledge of facts; understanding of concepts, principles, and theories; mastery of skills, habits, and motor abilities; acquisition of desired feelings, sensitivities, and attitudes.

(b) Instructional materials, in wide variety, are available in sufficient numbers for each subject and each teacher. Books and materials (including some self-testing ones) in each teaching area cover a wide range of reading and achievement levels in each subject taught in that area, and all of these aids are identified in such a way as to indicate their purposes.

(c) Pupils frequently work both independently and in groups of from two to six. Instruction is generally given in these small groups, very seldom to an entire class. Individual effort is encouraged and rewarded.

(d) Students are grouped and regrouped for instruction according to such criteria as general ability, achievement, interests, diagnosed deficiencies, and capacity for self-direction. Movement from one group to another occurs whenever evidence of achievement or need for another type of instruction would indicate that this is appropriate—not just at the end of a unit, book, term, or year. Students complete at various times of the year what would normally be considered the work of a particular grade or of a particular level of schooling.

(e) Sequential evaluation devices (some of them intended for student use) are provided. These are designed to measure almost constantly the extent to which specific instructional objectives have been met. Some of these are diagnostic and contain references to appropriate remedial materials. Student progress charts are kept and are used in making decisions about grouping, grading, and assignment of future work.

(f) All members of staff are committed to the program and are making a serious effort to carry it out. Administrative rules that would hamper the program have been either modified or eliminated.[37]

Recent professional literature abounds with claims concerning the superiority of nongraded organization over graded organization. One of the advantages claimed is elimination of the teacher's fear of encroaching on materials normally taught in higher grades. Another is elimination of transfer problems now experienced by pupils whose parents move from one school district or province to another. But the most important advantages claimed concern the cognitive development of children. In a recent article on learning, T.J.Mallinson, Chairman of the Communications Centre at Simon Fraser University, urges teachers and administrators to recognize fully "the uneven nature of cognitive development and the enormous variation in the distribution of specific skills," to "reduce the use of graded classrooms," and to "put students of various ages together for varying periods of time."[38]

2. Individualized Instruction

Because we know that learning is individual and personal-subjective, it follows that *nothing in the educational system should deny the fact that each child is an individual and must learn as an individual.* To pay insufficient attention, as we teach, to differences in age, sex, interests, physical growth, emotional stability, social class, and innate talents or disabilities is to deny this important principle.

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[33] Bruce Mickleburgh, "People Just Love Antiques (like Standard Curricula)," *Monday Morning*, April, 1967, p. 7.

[34] N.E.Nelson and G.A.Nelson, "When the Child Works Out His Own Programme," *Monday Morning*, April, 1967, p. 22.

[35] Robert F.Carbone, "Criteria for Evaluating a Non-Graded School," *Educational Technology*, VI (August 15, 1966), 12-19.

[36] *Ibid.*, p. 12.

[37] *Ibid.*, pp 15-19

[38] T. J. Mallinson, "Pipe-dreams About Intelligence," *Monday Morning*, April, 1967, p. 51.

To disentangle the concept of individualized instruction from the concept of continuous progress is, as we have suggested, a difficult if not impossible task. It would, of course, be logically and practically impossible for a school to have fully individualized instruction without at the same time having continuous progress. On the other hand, we believe that there is nothing logically or practically absurd about the idea of a school having continuous progress without having individualized instruction *in the full and complete meaning of that term.* It is certainly possible to envisage an elementary school in which the emphasis is on sequential goals, varied materials, small group instruction, flexible grouping, and sequential evaluation but which does *not* actually offer individualized instruction in the ultimate sense.

What, then, *is* individualized instruction in this (ultimate) sense? Certainly it is something that can be of tremendous assistance in implementing a nongraded or continuous progress program. But in comparison with nongrading, it is more dependent upon the use of specialized sequences of instructional materials, many of which should ideally be of highly sophisticated design. What this means in practice is that (administrators and teachers willing) continuous progress could be with us today—and actually is with us in a few schools. But individualized instruction is, for the most part, still on the drawing board.

Individualized instruction is not something that can be instituted by edict; it is something to be worked toward. There is much, on a small scale, that can be and is being done today by teachers—particularly by teachers who are working in nongraded situations. But the major task must be left for the "software experts." These are the skilled men and women whose job it is to close the gap between the present availability of computerized, electronic, and mechanical "hardware" (instructional devices and machines) and the unavailability, in quantity, of the experimentally validated "software" items (instructional materials) which are needed before these devices and machines can be widely used.

3. Integrated Curriculum

Because we know that learning is *unified,* we are aware of the fact that at any given time a child's world must make sense to him. *If we offer him, as education, unrelated scraps or even unrelated systems of information, we violate the principle of unity.* The most that can be expected is that the child will memorize our scraps or scrap-systems for reproduction in test situations—and forget them very rapidly thereafter. H. Gordon Hullfish, a leading American philosopher of education, expressed this thought most effectively when he wrote the following:

> *Thus, while we must organize materials, if teaching is to be effective, the actual curriculum. . . only comes into being as our materials impinge upon the lives of the students and lead them to a continuing reflective reconstruction of what they have heretofore known and believed.*[39]

Up to this point we have been discussing only one of two important facets of curriculum integration (or integrating). This aspect has been what is usually called *horizontal* integration—that is, the integration of a child's learning experience, generally by means of a project, unit, or enterprise approach, at any one time in his school career. *Vertical* integration, by contrast, is a way of ensuring that the years a child spends within our public school system possess unity of a different sort. Educators who employ this term generally do so in the process of stressing a need for greater continuity among the experiences of the child as he moves from the kindergarten into the elementary school, then into the senior public or junior high school, and finally into the secondary school. There is concern, as well, that transitions from secondary school to post-secondary institutions should be smooth and well planned rather than abrupt—even traumatic—as they can be under most existing programs. (For particularly adept high school students, it is frequently recommended that there should be advanced placement courses at university level; for the slowest high school students, it is suggested that there should be remedial courses covering elementary school work.)

Decisive steps toward vertical integration have already been taken by one of our borough boards. In North York, an integrated system of organization was approved in April, 1967.[40] Administrative changes have been made in order to "streamline [the] operation, eliminate duplication of effort, and lead to decentralization of authority."[41] Among the hoped-for advantages of integration are consideration of the curriculum "from the point of view of the child's total school experience from Kindergarten to Grade 13."[42] In all but a very few subjects, co-ordinators have been appointed on a K-13 basis.[43] Teachers now are responsible for knowing what and by what methods a student has previously been taught, as well as what

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[39] H Gordon Hullfish, "Integrating the Curriculum: a Review Essay," *Educational Research Bulletin*, XXXVII (September, 1958), 150.

[40] Memorandum to principals, vice-principals and co-ordinators from F.W.Minkler, Director of Education, Board of Education for the Borough of North York, Willowdale, Ontario (April 27, 1967).

[41] *Ibid.*, p. 2.

[42] *Ibid.*

[43] *Ibid.*, p. 3.

and by what methods the student will be taught at the next stage of his educational progress.[44]
The memorandum concludes with the following statement:

The introduction of an integrated system or organization is a milestone in Ontario education and we hope that it will break down the artificial barriers which have plagued Ontario's educational system for a century and will lead directly to an understanding and appreciation of education, even in the formal setting of the schools, as an integral part of personal development and growth.[45]

4. Abundant and Varied Materials

Because we know that learning is selective—that human beings tend to accept new learning in such a way that it supports their existing beliefs, expectations, and biases—*the school should expose the child to as great a variety of educationally relevant stimuli as is possible within its limitations of time and money.*

The rigid, factually oriented curriculum of the nineteenth and early twentieth centuries did not require a multitude of means to achieve its goals. In its more extreme forms, it was concerned only with the routine and the predictable. Print was the prevailing medium. Teaching aids were used primarily to provide breaks in the routine, not as an integral part of the curriculum. This is a heritage which many teachers still find it difficult to escape.

Today, however, there is an abundance of materials in many media. While the millenium has not yet arrived (witness: the hardware-software gap), the educator is even now confronted with a bewildering array of books, films, programmed courses, filmstrips, and projectuals—to name only a few of the items on the market. Recent interest in education as a primary market on the part of large corporations indicates that more and more new materials will be forthcoming. In addition, television offers to education an essentially limitless range of visual-auditory experiences.

While materials are relatively plentiful, money is not. Every teacher cannot have an unlimited amount and variety of materials. Furthermore, materials differ in quality. Some are better than others in some ways or for some purposes. Educators face a host of difficult decisions about materials; they must often select on the basis of scanty information.

Exhortations to select according to educational objectives, the nature of the subject matter, the needs and tendencies of the learners, and relative cost are commonplace. But such advice may not always be helpful in specific situations. Objective evidence concerning effectiveness is often lacking. Ultimately, perhaps, teachers' associations and school boards may be forced to develop facilities for evaluating and rating commercial educational materials.

To point out these difficulties is not, of course, to disparage in any way the general notion of improvement in the production of learning materials.

5. Competent, Committed Teaching Staff

The knowledge that learning is a natural and purposeful interplay between the child and his environment imposes awesome responsibilities upon the managers of the child's classroom environment—his teachers. That this realization has recently been a source of concern is evidenced by the tabling in February, 1966, of the Report of the Minister of Education's Committee on the Training of Elementary School Teachers.[46]

More, of course, will be said on this subject in the Chapter entitled *Teaching and Teachers*. There we shall deal with teacher preparation procedures of yesterday, today, and tomorrow; with internship plans; with plans for updating the professional qualifications and skills of qualified teachers. There, also, we shall speculate concerning the role of the teacher in school environments of the future.

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[44] *Ibid.*

[45] *Ibid.*, p. 4.

[46] Ontario Department of Education, *Report of the Minister's Committee on the Training of Elementary School Teachers* (Toronto: Ontario Department of Education, 1966).

As more and more informational tasks are taken over by the computer, teachers will be released from much of their traditional work. More of their time will be available for the social process of listening to what children say and sharing with them the joys of learning.

Applewood School, Mississauga.

Photo courtesy *School Progress.*

Chapter 3
Teaching and Teachers

The seemingly innocent question, "What is teaching?" has recently been the wellspring of a small torrent of educational literature. Some of the writings on the subject have been philosophical analyses of the concept of teaching.[1] These and others[2] have been attempts to create a theoretical framework for empirical studies concerned with the effects of the teacher's behavior in the classroom. Still others have been considerations of the question of whether viable theoretical frameworks for the study of teaching are even possible today, given the present state of educational research techniques.[3]

The elementary school teacher performs a job which is difficult to define, at least in any exhaustive way. Looking at teaching within the logical framework of this Report, however, it is possible to offer a tentative account of it which should find a reasonable degree of acceptance within the profession.

It would appear, first, that teaching is the activity of translating aims and objectives, in the light of what we know currently about learning and about society, into a large number of separate skills, abilities, and attitudes which it is hoped pupils will acquire during their school years. Secondly, teaching is the activity of creating situations which are thought to increase the likelihood that children will acquire the hoped-for skills, abilities, and attitudes—the majority of these situations being located physically within the school building and grounds and temporally within the school day and year. Thirdly, teaching includes the activities of evaluating pupil progress within these situations and toward these goals, reporting such progress to parents and administrators, and modifying the teaching process itself in accordance with the evaluations made.

Among the limitations of this attempt at a procedural definition of teaching is the fact that it does not completely take account of the extraordinary context in which our society now confronts its educational problems. It is essential to include in our idea of teaching the notion that *many of its elements will probably undergo rapid change.*

Aims and objectives for education are perhaps at their most stable when we are dealing with the elementary school. Yet even here, we are seeing metamorphoses. And if our aims shift, so also will many of the separate skills, abilities, and attitudes which are seen as instrumental to these aims. But the creation of learning situations and the evaluation of pupil progress are even more open to alteration.
An advancing technology not only affects the general aims and specific instructional goals of teaching; it simultaneously provides new means for reaching these goals and new ways of knowing whether we have succeeded.

Major Characteristics of Teaching

The professional literature concerning the teaching process is, as we have suggested, voluminous. Moreover, it is full of speculation and reflects considerable anxiety concerning the theoretical foundations of research in the area. In spite of this, it is possible to derive, from an acquaintance with this body of literature, a few statements which seem to embody some degree of consensus. We shall now list and explore four statements of this kind about teaching.

1. Teaching is Natural

In the sense that it takes place informally in many places other than the classroom, teaching is a natural activity. People are continually "teaching" or "instructing" one another. This is a part of our ordinary interaction.

"What a good car means, in my opinion, is. . . ."
"You are going to have to treat me with more respect, or. . . ."
"It's hard to explain, but. . . ."

These are the ways we teach each other in conversation. On the non-verbal level, we instruct one another with looks, gestures, and special signs. Teaching in the school, then, is a deliberate and concentrated form of an everyday human behavior.

2. Teaching is Situational

While teaching can and does take place on the street, in the home, and in the factory, the kind of teaching which is seen as a full-time occupation and as a professional activity is situational. It takes place, for the most part, in schools. This means, at present, that it takes place mainly between nine and four o'clock, Monday through Friday, September through June, and that it occurs primarily within particular buildings. (Field trips and Saturday morning classes are exceptions.) The situational nature of teaching also means that it takes place within a framework of rules, conventions, and established procedures. However much of an individualist or creative personality a teacher may be, he must work within this framework.

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[1] See, for example, B.Othanel Smith, "A Concept of Teaching," *Language and Concepts in Education*, ed. B.O.Smith and Robert H Ennis (Chicago: Rand, McNally & Co., 1965), pp. 86-101.

[2] See, for example, Hugh Perkins, "A Procedure for Assessing the Classroom Behavior of Students and Teachers," *American Educational Research Journal*, I (November, 1964), 249-60.

[3] See, for example, Clinton St.John, "Can Science Teaching Be Scientific?" *Journal of Research in Science Teaching*, IV (December, 1966), 230-35.

3. Teaching is Interactive

School administrators, parents, and the public expect that pupils will acquire beliefs, values, and manners from exposure to the example of the teacher who functions as "model adult" in daily social encounters. Expectations of pupils also must be taken into account, since pupils will not accept an individual in the role of teacher unless he or she fulfills these expectations. The teacher's role is complicated, diffuse, and highly interactive.

4. Teaching is Purposive

Even when it is taking place in a casual, out-of-school situation, the act of teaching is, fourthly, a purposive one. Within the school, this aspect is accentuated. To teach someone is, first of all, to form a clear intention to modify his beliefs—and, consequently, his behavior. *Learning* can, of course, occur in the absence of teaching. But *teaching* takes place only where the teacher intends that learning should result from what he does and where this expectation is a reasonable one in the circumstances.

Teaching in K-6 Schools

The purposes according to which the elementary school teacher directs her activities are many and diverse—so much so that it would seem almost impossible to list and classify them. Perhaps the simplest pattern of classification is one that emerged in our chapter on *Objectives*—the notion of the school as having a triple focus—as being at once child-centred, society-centred, and knowledge-centred, and as making some attempt at achieving a workable balance.

To engage in child-centred teaching is to *stimulate* the child by encouraging, motivating, and understanding him. To engage in society-centred teaching is to *socialize* the child by disciplining, admonishing, and counselling him. (Deportment, citizenship, and character formation are some of the words often used in discussing this kind of teaching.) To engage, finally, in knowledge-centred teaching is to *instruct* the child by presenting him with information, by evaluating his performances, and by helping him to discover basic principles and methods of attaining, organizing, and using knowledge.

The child-centred teaching activities we have listed are usually performed with the object of making the child a happier person with a greater chance for self-fulfillment. That children can achieve more on a cognitive level when all is well in the affective domain is another argument for these activities. That well-adjusted children are unlikely to engage in antisocial activities is still another.

Society-centred teaching activities are directed at enabling pupils to live in harmony with others. In Metro today, the social goals of the elementary school include basic manners, literacy, and acceptance of major social institutions.

Knowledge-centred teaching activities are generally aimed at inculcating a certain amount of basic content plus a group of techniques for mastering new information as the need for it appears on the child's horizon.

Society-centred and knowledge-centred teaching activities, of course, overlap one another. Similarly, both overlap the child-centred area.

Preparation of Teachers in Teachers' Colleges

Elementary school teaching—whatever else it may be—is at least a process or mode of behavior with which nearly all adult citizens are familiar, owing to their own childhood interaction with it. Elementary school teaching is also a regular, paid occupation for approximately 12,000 men and women in Metro.[4] Finally, it is a profession into which people are initiated in specially designed institutions—namely, our teachers' colleges.

Over the past century, teacher education has experienced many shifts of emphasis. In the Upper Canada period, many of our elementary school teachers became such by means of a simple step from pupil's bench to teacher's chair.

> *The pupil* [*before 1830*] *usually became a teacher without receiving a broader education in secondary school or college. He also acquired from his own elementary school experience firmly rooted ideas of pedagogical procedure without any subsequent corrective in the shape either of professional instruction or of some better example.*[5]

The exceptions were few. A small number of teachers had been trained in monitorial methods, and in neighboring Lower Canada, by 1830, some young men and women were being prepared for teaching careers in academies which offered combined programs of academic and professional courses.[6]

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[4] Ontario Department of Education, *Report of the Minister* (Toronto: Ontario Department of Education, 1966), p. 143. Cited hereafter as Minister's Report (1966).

[5] Charles E.Phillips, *The Development of Education in Canada* (Toronto: W.J.Gage Ltd., 1957), pp. 569-70.

It is likely that one reason for the slow development of normal schools, in what is now Ontario, was the widely held notion that education should consist only of the transmission of formal content from teacher to student. For the same and other reasons, the early normal schools were mainly content-oriented.[7] But by the mid-1860's, methods courses had assumed greater prominence.

> *In Ontario less than a quarter of the teachers were normal school graduates in 1875,* [*but those who were graduates*] *had received at least half a year's training, largely professional in nature.*[8]

After 1891, all of Ontario's teacher training institutions concentrated on professional education.[9] By this time, also, persons intending to become elementary school teachers were required to have some secondary education.[10] However, much pre-service training, even after 1900, took place outside the normal schools in county "model schools" by means of a much criticized internship or apprenticeship plan.

The period 1900-1940 witnessed an increase in normal school facilities and in years of secondary school education required for entrance. By 1949, there was an official recommendation by the Canadian Education Association that all elementary school teachers across Canada should receive more than one year of professional training following completion of a full secondary school program.[11] One stated purpose was to allow for more attention to subjects such as educational psychology and philosophy of education. C.E.Phillips, a prominent historian of Canadian education, wrote in the 1950's:

> *. . . the emphasis in teacher education has been . . . first, on knowledge of content; second, on methods of instruction; third, but only to an increasing extent and not predominantly, on an understanding of the pupil; and fourth, but only slightly as yet, on an understanding of the world in which education must play its part.*[12]

Since the publication of Phillips' book, we have seen the beginning of a shift (which he predicted) "towards university responsibility [for the education of elementary school teachers] even in Ontario, where training for teachers in institutions for that exclusive purpose seemed to be most strongly entrenched."[13]

Apparently this represents a partial return to concern for content.[14] But the recent report of the Minister of Education's teacher training committee appears to recognize that the present system suffers from inadequacies of *many* kinds:

> *During the last quarter century there has been . . . an unprecedented growth in the body of knowledge . . .* [*yet*] *the necessity for providing physical accommodation has taken precedence over the updating of the curriculum and the improvement of the preparation of teachers.*
>
> *Whereas most of the other countries in the western world have for some time been aiming, with varying success, at goals in teacher education of two, three, or four years beyond high school, Ontario has so far continued to prepare its elementary school teachers in a one-year programme following secondary school graduation. . . .*
>
> *Our young teachers graduate with training in the actual skills of teaching which compares favourably with that provided in many other systems. But they face their task of teaching as less mature individuals than their duties require and with more limited academic and philosophical background than they should possess.*
>
> *In fact there appears to be a growing conviction among thoughtful parents and the public at large that most graduates from our Teachers' Colleges are too young, too immature, and less well prepared academically than they should be.*[15]

According to the Minister's Report (1966)[16] this Committee's findings are "of prime importance," and during 1966 a number of minor changes were made which were, in a general way, consistent with the spirit of the recommendations. Of particular interest were special courses at five teachers' colleges for a total of 192 elementary school teacher trainees possessing university degrees.[17]

The appearance of the MacLeod Report has brought into the open many of the factors which lie at the root of our educational problems. The MacLeod Committee has rejected patchwork approaches to the solution of these problems. Instead, it calls for "a complete reappraisal of the role of the elementary school teacher . . . a new concept of teacher education, and a major attempt to achieve [it] as rapidly as possible."[18] Formal recommendations include careful initial screening of candidates for teacher education programs, four-year courses carried on within university settings, and preparation of elementary and secondary teachers within the same institutions.[19] (In 1966, *46* American states demanded and *enforced* degree requirements for their *lowest* regular certificates for elementary school teachers.)[20]

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[6] *Ibid.*, p. 570.

[7] *Ibid.*, p. 571

[8] *Ibid.*, p. 576.

[9] *Ibid.*, p. 579

[10] *Ibid.*, p. 576

[11] *Ibid.*, p. 582.

[12] *Ibid.*, p. 584

[13] *Ibid.*

[14] Ontario Department of Education, *Report of the Minister's Committee on the Training of Elementary School Teachers* (Toronto: Ontario Department of Education, 1966). Cited hereafter as MacLeod Report

[15] *Ibid.*, p. 11

[16] Minister's Report (1966), p. 15

[17] *Ibid.*

[18] MacLeod Report, p. 12.

In May, 1967, Education Minister William Davis announced the beginning of a new teacher education plan which is designed to implement many of the Committee's recommendations. Teachers' colleges will gradually be integrated with universities.

> *The changeover . . . will be gradual. The pace of improvement will be affected by the necessity of maintaining a steady supply of teachers.*
>
> *Mr. Davis said that the first step would probably provide that a prospective [elementary school] teacher entering university would take a two-year program with each year divided between academic work taken in the usual university courses and teacher training. "Later, the requirement might change to a full year of academic work followed by a two-year program. . . . This pattern could then be extended to the ultimate requirement of the minimum of the degree and certificate."*[21]

Internship Programs in Teacher Education

The Minister's 1966 Report[22] states than an internship plan has been initiated in accordance with Recommendation 8(c) of the MacLeod Report.[23] This plan is one which has been adapted from plans already in operation in California, Wisconsin, and other areas.[24]

> *Candidates who were 25 years of age as of 1 June, 1966, and who held acceptable university degrees and additional qualification equivalent to a year of postgraduate study . . . were selected by boards of trustees whose elementary school enrolment totalled 3,000 pupils or more. . . . The course consists of four weeks of observation and teaching experience in schools during May or June, a six-week summer course offered by the Department of Education, internship experiences in the schools from September to December, regular classroom teaching from January to June and a final six-week summer course. Following completion of the second summer course in 1967, some 65 candidates will be granted an Interim Elementary School Teacher's Certificate, Standard 4.*[25]

It is important to realize that the type of internship program described above was recommended by the MacLeod Committee *"only as a supplement to other plans of teacher preparation."*[26] *(Italics ours.)* It is merely *one of three* recommended plans, the other two being

(1) a concurrent one, in which academic and professional education would be linked closely,
(2) a consecutive one, in which an academic education would be followed by professional training.[27]

Updating Programs for Teachers

Obviously, our society expects a great deal of its teachers. And too often we have been unwilling to make expenditures which are realistic in terms of these expectations. Recently, however, the tide appears to have turned. We in Ontario are taking a new approach to the initial preparation of our elementary school teachers. We are also becoming increasingly aware of some of their other professional requirements, such as their need for continuing education.

Summer schools, night schools, curriculum conferences, professional development days, workshops, exchange programs, sabbaticals, and a host of other in-service arrangements are some of the provisions that have been made for the continuous updating and retraining of teachers. The intentions have been to compensate for initially inadequate preparation, to offset subject-matter obsolescence, and to ensure that teachers remain in the mainstream of educational thought and practice.

In the past, teachers were expected to keep up to date on their own time, with local boards, the Department of Education, teachers' organizations, and universities providing facilities and instruction. But this arrangement has become increasingly unrealistic in an era of proliferating duties and rapidly expanding knowledge. Professional development days are a formal recognition that updating activity is an integral part of the teacher's job and not something to be done after hours out of good will or love of teaching.

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[19] *Ibid.*, pp. 53-57.

[20] National Education Association, National Commission on Teacher Education and Professional Standards, *Milestones in Teacher Education and Professional Standards* (Washington, D.C.: National Education Association, 1966), p. 21. The figure 46 is based on a total of 52, which includes the District of Columbia and Puerto Rico.

[21] "It Sounds Splendid," *Globe and Mail*, May 5, 1967.

[22] Minister's Report (1966), p. 17.

[23] MacLeod Report, p. 53.

[24] *Ibid.*, p. 28.

[25] Minister's Report (1966), p. 17.

[26] MacLeod Report, p. 17.

[27] *Ibid.*

Professor John Ricker of the College of Education, University of Toronto, claims: "The teacher of the future will remain—must remain—a student throughout his entire teaching career." He continues as follows:

> *The most pressing single need in education today is a recognition that continuous teacher education must become an integral part of every teacher's program —not an extra course in the evening or after school, nor something in addition to a full load. But provision for continuous study must be provided for within the teacher's regular timetable. This may mean one non-teaching afternoon each week—it may mean more.*[28]

While Ricker's remarks were directed to the condition of secondary school teachers, they seem equally relevant to that of elementary teachers. This is implicitly the position taken in a recent publication of the National Education Association in the United States:

> *If the competency of the staff is to be maintained, ample opportunities to improve must be offered through in-service programs and orientation activities for* which time is provided.[29]
> *(Emphasis ours.)*

Even with reasonable amounts of updating time within regular job hours, massive efforts will be required. Certain kinds of learning demand that the individual remove himself from the work-family-community situation and become a full-time student. Only full-time study can enable a teacher to reflect upon his situation and performance, investigate new ideas seriously, reformulate his overall view of education, and build up a synthesis of teaching practices appropriate to his purposes. Ricker sums up by predicting:

> *Along with opportunities for continuous academic development on a week-to-week sort of basis there will also be opportunities for, indeed insistence upon, more extensive periods of study either in one's discipline or in the general field of education. . . . Every ten years at first and ideally every five, teachers will have a chance to—preferably will be required to—leave the classroom to do further study if they wish to receive their increments. The whole idea that teaching is a static condition rather than a process of continuous growth will disappear.*[30]

Like a ship, a teacher needs both routine maintenance and periodic refitting. Gradually increasing amounts of time and money are being budgeted for both purposes.

The Teacher in a Team Situation

One of the objectives of a number of experiments with team teaching over the past decade has been the improvement of the working conditions and career opportunities of the teacher. In some team teaching situations it is possible, for example, for a particularly able and well qualified teacher to win promotion—a marked increase in pay and status—without becoming either a consultant or an administrator. She can, in short, move ahead as a professional *teacher.* This is subtly different from the more common situation in which the able teacher becomes a department head. It gives greatest recognition to the person who can best fill the role of master teacher of children, rather than to the person who can best direct the activities of other adults. Another difference between team teaching and departmentalization is the fact that team teaching is more easily adapted to the existing structure of the elementary school.

A fuller treatment of team teaching will be found in a later section. Our purpose here is not to examine its pros and cons—let alone to evaluate the concept. It is merely to point out that some educators are concerned about the problems of keeping the very best teachers within reach of children, while at the same time offering to these gifted men and women career possibilities comparable with those elsewhere in education and in other fields.

The Teacher in an Automated World

The MacLeod Report has, in a qualified way, placed its authority and prestige behind another movement which must soon have some impact upon all teachers. The Report has pointed to an important shift of emphasis—the shift away from the teacher's role as disseminator of information and toward "one of providing opportunity to explore, to discover, and to create. . . ."[31]

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[28] John C.Ricker, "The Teacher of the Future," *Alberta Teachers' Association Magazine*, October, 1966, p. 19.

[29] George Manolakes, *The Elementary School We Need*, (Washington, D.C. Association for Supervision and Curriculum Development, 1965), p. 14.

[30] Ricker, *loc. cit.*

[31] MacLeod Report, p. 9.

For most people today, it must be difficult to break away from the concept of the teacher as primarily a conveyor or purveyor of knowledge. If it is important for teachers to be better-educated persons—and we believe that it is—the reason is not that they will then be more competent purveyors of fact. It is rather that they will become better representatives, within the classroom, of the highly civilized world in which we hope our children will live.

The reasons for the shift away from the role of disseminator are many. Prominent among them is the rejection by many educators of rote memorization and content-mastery, per se, as objectives. But the most overwhelming reason is the rapid approach of an electronic era in which computer-assisted instruction (CAI) will assuredly play a major role.

There seems to be little doubt that CAI is on its way. Indeed, the computerized machinery or "hardware" required for it is already available and is in use on a limited scale. And while the scarcity of the "software" (instructional materials in the form of computer programs) is severe at present, this will certainly diminish with time.

Prophets of computerized education differ among themselves concerning the length of time it will take to bridge the hardware-software gap. They seem to agree, however, that the gap will ultimately be bridged. This is well illustrated in a paper presented in April, 1967 by Professor John O. Fritz of the Ontario Institute for Studies in Education:[32]

> *Perhaps the most intriguing development during the past five years has been the active interest shown by some corporate giants . . . in education. . . . One indication of their seriousness of purpose has been the mergers that have occurred among "hardware" and "software" producers—General Electric with Time Inc. and Silver Burdett; I.B.M. with Science Research Associates; RCA with Random House; and Xerox with University Microfilms and Basic Systems. . . .*
>
> *There is little question that the mergers will succeed in doing much more expeditiously what has been accomplished only through labored and often protracted efforts by non-profit enterprises—the development of new curricula and materials of instruction.*[33]

Fritz believes that we can expect "highly significant advances in future curriculum packages as concerted approaches are made by a team of subject matter, learning, curriculum and media specialists and systems engineers."[34] He also makes it plain that this "systems" approach is based on the premise that increased clarification and specification of purposes and processes will lead to the creation of more powerful teaching tools.[35] Finally, he stresses the fact that the crowning feature of these systems will be their almost infinite sensitivity to the precise, moment-by-moment requirements of the learner. "A learner may tap a vastly increased array of 'alternatives' at any point of 'error' in such instructional systems."[36]

There has been a great deal of speculation in educational journals, in teachers' magazines, and in the mass media concerning the role of the teacher in a school where instruction is automated.

It seems clear, at present, that there will be a rather lengthy transitional period. During this time, teachers will continue much of their present work. As at present, they will spend many hours in gathering and organizing information and in presenting it to pupils. Some teachers will direct much of their energy toward maintaining discipline or control. Only a relatively small proportion of their time and personal resources will therefore be available for what might be designated "tutorial interaction"—the social process of listening to what children have to say, sharing with them the joys of learning, and demonstrating an interest in and a respect for each individual child.

With the gradual advance of computer-assisted instruction, however, it seems probable that there will be a shift in the distribution of teacher time and energy. It is clear that many informational tasks can be taken over by the computer. It is hoped that the consequent individualization of instruction will increase the attentiveness of pupils and hence reduce school discipline problems. It therefore seems likely that the teacher—freed, by degrees, from much of his traditional work of presentation and control—may gradually assume a different role, possibly the role of tutor in the interactive process we have described.

It is possible, then, that teaching, as a profession, may be liberated by automation rather than threatened by it. What seems most probable is a gradual shift of emphasis within teaching. A high degree of methodological skill and mastery of subject matter will probably remain important teaching assets for quite a long time. But many educators now believe that tomorrow's teachers will feel an ever-increasing need, within themselves, for the qualities of intellect and personality which have always been marks of genuinely great teachers—the qualities of humanity, open-mindedness, curiosity, and rationality.

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[32] John O. Fritz, "The Emergence of Instructional Systems-the Educationist's Predicament," Paper discussed in a seminar of the Department of History and Philosophy of Education, Ontario Institute for Studies in Education, April 18, 1967, p. 9. (Quoted by special permission of the author.) (Mimeographed.)

[33] *Ibid.*, pp. 13-14.

[34] *Ibid.*, p. 10.

[35] *Ibid.*, p. 9.

[36] *Ibid.*, p. 11.

In short, the teachers of the future will need to be truly educated persons, men and women capable of serving for the child as models of the mature and civilized person. These teachers will stimulate, challenge, and encourage more often than they will inform. Ours is an era when machines can provide information on demand and are capable of suggesting sequence, form, structure, and obvious relationships within the curriculum. Soon there will be more time for teachers to speculate (out loud) about the non-obvious and to raise and respond to questions concerning the values, norms, and aspirations of pupils and their society. There will be time for all teachers to do what gifted ones have always managed somehow to do—to interact with pupils on a personal level and to inspire them with a desire to understand and improve their world.

One prominent trend in curriculum building is toward greatly increased attention to individual differences.

Applewood School, Mississauga.

Photo courtesy *School Progress*.

Chapter 4
Curriculum

The curriculum is such a "semantic jungle"[1] that there is a temptation to define it by saying that a curriculum is a curriculum is a curriculum. . . .
Is the printed course of study the curriculum?
Is the curriculum the total amount of subject matter to which students in a classroom are exposed?
Or is the curriculum simply the total school environment?

The prosaic dictionary definition of curriculum is "the whole body of courses offered in an educational institution, or by a department thereof."[2] Many pupils probably experience as the curriculum something closer to the exhausting round of events the ancient Romans were thinking about when they used the word. But neither of these definitions is of much help. Hence, it is not surprising that most of the briefs submitted recently to the Hall Committee on the Aims and Objectives of Education in the Schools of Ontario talk about curriculum without defining it. The Ontario Curriculum Institute has also struggled with the term. Finally, it determined that for its purposes the curriculum was "all the experiences the learner encountered while he was part of school life."[3] This is a rather passive definition which echoes many writers on curriculum since 1900.[4] James B. Macdonald, a curriculum specialist at the University of Wisconsin, defined it in 1965 as "the major source of stimuli found in instructional settings."[5] But in 1963 he defined it much more broadly as "status of, or change in, pupil behavior pertinent to the goals of the school."[6] A definition which is both simple and suggestive of interaction is that of publisher Wilfred R. Wees. "The curriculum," he says, "is what child and teacher, child and child, do together in the classroom to help themselves and to help one another grow."[7]

In discussing curriculum, the question of aims is pivotal. The literature is replete with sage observations that unless the aims are clearly seen and clearly followed, it is impossible to say what should be taught.[8] (Yet, as we have seen, the process of developing meaningful statements concerning aims is a complex one.) Just as central—and just as perplexing—is the task of ensuring that our ways of organizing curricula do not run counter to what we know about the learning process—rudimentary as this understanding may be.

Historical Perspective

The three R's curriculum of the Common schools of pioneer America went more or less unquestioned by a society which was working to attain literacy for all its citizens. This was functional education, and as such it satisfied the majority of the people. Besides, the school was seen as providing "only an insignificant aspect of the experience of the young."[9] (Have we come full circle with Marshall McLuhan?)

By the end of the 1800's, however, a rapid transition in education was to reflect an optimistic and robust period, a time of many discoveries in the sciences and in medicine, and a phase of rapid development in communication and transportation. More and more subjects were being added to the curriculum. It was beginning to be accepted that the school should perform a dual function—transmission of the accumulated wisdom of the ages and accommodation of new social needs through the teaching of practical subjects.

By 1900 the scientific movement in education had begun. Norms were developed in child study. The concentration was on specific aspects of development, and not on interrelationships within the individual of these various aspects or on interrelationships among individuals in groups. Limited as these early studies were, they had implications for teaching in accordance with individual differences which were largely ignored by the curriculum of the day, with its subject orientation and its emphasis on training for a job. The familiar question, "What knowledge is of most worth?"[10] was being bandied about both by those who favored mental discipline and those who were occupation-oriented. Educational goals were seen in terms of adult activity, and much research was being done in individual subject areas to tabulate skills, information, and concepts so as to justify their place and role in the curriculum. But there was no overall design for the curriculum.

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[1] John Goodlad, *School Curriculum Reform in the United States* (New York: Fund for the Advancement of Education, 1964), p. 53.

[2] *Webster's Seventh New Collegiate Dictionary* (1961).

[3] Ontario Curriculum Institute, *Children, Classrooms, Curriculum and Change*, A Report of the Committee on the Scope and Organization of the Curriculum (Toronto: Ontario Curriculum Institute, 1966), p. 4.

[4] Walter W Cook and Nolan C.Kearney, "Curriculum," *Encyclopedia of Educational Research*, ed. Chester W Harris, 3d. ed. (1960), p. 358.

[5] James B.Macdonald, "Educational Models for Instruction," *Theories of Instruction*, ed. James B.Macdonald and Robert R Leeper (Washington, D.C.: Association for Supervision and Curriculum Development, 1965), p. 1.

[6] James B.Macdonald, "Curriculum Research: Problems, Techniques and Prospects," *Review of Educational Research*, XXXIII (June, 1963), 322.

[7] W.R.Wees, "A Point of View in Education," Address to the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario, Toronto, December 1, 1966. Second Section, p. 4.

[8] See, for example, Ole Sand, "Education for Quality," *New Dynamics in Curriculum Development* (Toronto: Ontario Curriculum Institute, 1965), p. 11.

[9] Lawrence A Cremin, *The American Common School: An Historic Conception* (New York: Bureau of Publications, Teachers College, Columbia University, 1951), p. 216.

John Dewey reacted to "the long centuries of the history of all peoples" being superimposed on the child's "little span of personal memory."[11] Dewey felt that "the essence of educational theory" was "the due interaction" between the child, "the immature undeveloped being," and society with its adult aims, values, and logic. How modern the following passage sounds in the light of today's "experience" approach to learning:

> *What, then, is the problem? It is just to get rid of the prejudicial notion that there is some gap in kind (as distinct from degree) between the child's experience and the various forms of subject-matter that make up the course of study. From the side of the child, it is a question of seeing how his experience already contains within itself elements—facts and truths—of just the same sort as those entering into the formulated study; and what is of more importance, of how it contains within itself the attitudes, the motives, and the interests which have operated in developing and organizing the subject-matter to the plane which it now occupies. From the side of the studies, it is a question of interpreting them as outgrowths of forces operating in the child's life, and of discovering the steps that intervene between the child's present experience and their richer maturity.*
>
> *Just as two points define a straight line, so the present standpoint of the child and the facts and truths of studies define instruction. It is continuous reconstruction, moving from the child's present experience out into that represented by the organized bodies of truth that we call studies.*[12]

Despite his emphasis on interaction, Dewey's influence, which had its greatest impact after 1930,[13] polarized the educational world: at one extreme, the child with his needs and interests; at the other, adult society with its needs for specific knowledge and skills.

Both centres of interest were heavily researched in the 1930's. The Depression stimulated studies on social trends and social values. Questions were formulated concerning the school as a social force[14]—questions which persist unanswered in our own time. However, these studies had less impact on the curriculum than the studies of "the learner as a dynamic organism."[15] Gestalt psychology and the whole child, Thorndike's "belongingness" and motivation, the IQ controversies (including the effect of cultural differences), the case-study approach, and the broadening of the measurement movement all led to greater understanding of the individual child and of the dynamics of interpersonal relationships.

A variety of curriculum emphases in the elementary school began to appear. The most widespread was the unit-of-work approach.[16] (The enterprise method, as outlined in the Ontario Programme of Studies for elementary schools,[17] is an example.) There are several familiar objectives in this type of curriculum. Learning is seen as problem solving. Themes which are created out of the experience of pupils will be relevant to the pupils. Both individual research and group work are involved. Although motivation levels were high, the units themselves frequently proved to be stereotyped or set pieces because of predetermined subject matter.

Emphasis on the individual also led to the "needs" curriculum, the "experience" curriculum, the "emerging" curriculum, and the "persistent life situation" curriculum. The prime objective behind these curricular schemes remains with us today: that of helping the child to develop at his optimal rate. Many of the attempts at implementation, however, were clumsy. It has seemed since, that although the idea was basically sound, "educators were handicapped by not having as good an understanding of the nature of the separate subject fields being integrated as is now beginning to be available."[18]

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[10] Herbert Spencer, "What Knowledge is of Most Worth?", *Westminster Review*, July, 1859.

[11] John Dewey, "The Child and the Curriculum." Reprinted with the permission of Martin S.Dworkin, editor, *Dewey on Education* (New York: Teachers College Press), © 1964, Teachers College, Columbia University.

[12] *Ibid.*, pp. 96-97.

[13] Arthur W. Foshay, "Changing Interpretations of the Elementary Curriculum," *The American Elementary School*, ed. Harold G.Shane (New York: Harper, 1953), p. 117.

[14] See, for instance, George S.Counts, *Dare the Schools Build A New Social Order?* (John Day Pamphlets, No. 11; New York: John Day Co., 1932). It is interesting to note that in January, 1967,Toronto's University League for Social Reform sent out a notice proposing a meeting to discuss whether education should reflect society or education should shape society.

[15] Margaret McKim, "Curriculum Research in Historical Perspective," *Research for Curriculum Development*, Fourteenth Yearbook of the Association for Supervision and Curriculum Development (Washington, D.C.: National Education Association, 1957), p. 21.

[16] Foshay, *op. cit.*, p. 118.

[17] Ontario Department of Education, *Programme of Studies for Grades 1 to 6 of the Public and Separate Schools* (Toronto: Ontario Department of Education, 1960), pp. 16-23.

[18] Alice Miel, "Knowledge and Curriculum," *New Insights and the Curriculum*, Twentieth Yearbook of the Association for Supervision and Curriculum Development (Washington, D.C.: National Education Association, 1963), p. 94.

School curricula are responsive—though sometimes slowly—to changing social situations. We have seen several swings of the pendulum: from preoccupation with the three R's to concern with rather abstract subject matter, from concern with communication of information for its own sake to interest in the school's social role, from interest in the school as a part of the social structure to study of the needs of the individual child. Today, as we have seen, there is emphasis on "the child in society."[19] And this approach seems to embrace many, if not all, of our earlier preoccupations, including the interest in excellence in intellectual pursuits.

J.R.Suchman defines the goals of today's curriculum as "to get children to stir up information"[20] and to "develop a useful set of performance skills."[21] However, it is difficult to state which information and skills are useful for today's—and tomorrow's—world.

John Goodlad and M.F.Klein[22] deplore fuzziness. They point out that educational intent must be spelled out in behavioral goals so that there can be accurate assessments of whether or not the goals are being met. One departure is the development of "tentative instruments . . . designed to determine what selected age groups of the population know and do not know, can and cannot do."[23] The purpose is not to set up norms against which to measure individuals but rather to determine what *is actually known* by specific age groups. Local school boards may set out the priorities of what *should be known* by their particular student population. Indeed, Goodlad and Klein suggest that it is their responsibility to do so.

A violent contrast is provided by the apparent implications for education of the widely publicized views of Marshall McLuhan. Listen, for example, to two of the words we hear so frequently today—*explosion* (population explosion, knowledge explosion, atomic explosion, technology explosion) and *revolution* (quiet revolution, microbook revolution, mathematics revolution, communications revolution). Both these words, *explosion* and *revolution,* are indicative of continuing and accelerating change.

Marshall McLuhan is certainly one of the most flamboyant prophets of change. His language is a mosaic of such expressions as "the medium," "the message," "electronic environment," "rearview mirror," "electric person," "extension of consciousness," and "sensory threshold." Many have found this mosaic insightful and exciting. Many have found it puzzling and disturbing. But however one may react to McLuhan, there is no denying his current impact. McLuhan seems to feel that if we will only stop looking in our rearview mirrors, we will be able to see the patterns of change, to program our own futures, and "spend our lives in our own school, the world."[24] "All the curriculum boundaries will disappear..."[25]

Perhaps the best way to convey the flavor of Professor McLuhan's comments on education is to present a number of them and to suggest that the reader attempt to form some overall impression of his own:

Suddenly today the child is merging with the total adult environment under electric information processing and is disappearing from the scene as a child.[26]

[They are a part of a new age of interrelation.] Then they go to school and are fed little fragmented bits of knowledge. Everything is classified and tied down in little niches. They are unable to piece it together.[27]

It's misleading to suppose there's any basic difference between education and entertainment.[28]

[Children today] have a completely different sensory life. . . .[29]

If . . . "massmedia" should serve only to weaken or corrupt previously achieved levels of verbal and pictorial culture, it won't be because there's anything inherently wrong with them, it will be because we've failed to master them as new languages in time to assimilate them to our total cultural heritage.[30]

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[19] This is the terminology of Arthur Foshay.

[20] J.R.Suchman, "Inquiry in the Curriculum," *Instructor,* LXXV (January, 1966), 24.

[21] *Ibid.*

[22] John I.Goodlad and M.F.Klein, "What's Happening in Curriculum Development," *Nation's Schools,* LXXVII (April, 1966), 70-73.

[23] *Ibid.,* p. 73. See also "A Long Hot Summer of Committee Work on National Assessment of Education," *E.T.S. Developments,* XIII (November 1965), 1-4.

[24] Marshall McLuhan and George B.Leonard, "The Future of Education," *Look,* February 21, 1967, p. 25.

[25] "Teachers Afraid TV Will Take Away Their Jobs, says McLuhan." *Toronto Daily Star,* January 13, 1965.

[26] Marshall McLuhan, "Invisible Environment," *Canadian Architect,* May, 1966, pp. 71-74 and June, 1966, pp. 73-75.

[27] "Piecemeal Teaching Causes Dropouts—Marshall McLuhan," *Toronto Daily Star,* November 17, 1964.

[28] Marshall McLuhan, "Classrooms Without Walls," *Explorations in Communications,* ed. Edmund Carpenter and Marshall McLuhan (Boston: Beacon Press, 1960), p. 3.

[29] Marshall McLuhan, Address to Provincial Committee on Aims and Objectives in the Schools of Ontario, January 19, 1967, p. 1.

[30] *Ibid.,* p. 2.

Films, videotape and even photography permit a rapid grasp of complex cultural gestalts, past and present, which the printed word cannot convey even slowly.[31]

The modern child has been everywhere, done everything, lived many lives.[32]

Involvement is a key word in the new electrical age. Involvement makes the printed newspaper an "oral" rather than a lineal medium. The newspaper front page exposes you simultaneously to news on all subjects from all over the world.[33]

What is going on inside the school is puny and undernourished compared to what goes on the moment the child steps outside.[34]

Our new electric environment has everything but no connections. It is simultaneous but not connected.[35]

Man has suddenly, in the electronic age left the age of the continuum . . . you cannot have fixed objectives. What do you put in their place? Roles! Involvement—participation in depth—in processes. Our youngsters understand this without fail. They understand that the new kind of world in which they live demands absolute participation in processes.[36]

They are totally at grips with it and what we want is to give them some detachment.[37]

The responsibility of the school system [would seem to be] to train perception, and it seems to me desirable that the young be trained in the ability to perceive the situation in which they live—the training of perception rather than the stencilling of instructions on the brain pan.[38]

The training of perception in our time means the training in pattern recognition and youngsters are very good at this.[39]

McLuhan is controversial; he believes in working "by dislocation of attention."[40] He has much to say which impinges on education. But he never says it succinctly in one place, and he is constantly expanding his interests. What he accomplishes, chiefly, is the injection of the most profound kind of doubt. Should we abandon all our schools as they now exist? Should we burn all our textbooks? Should we put a bomb under the Department of Education? Should we tell all curriculum designers to stop theorizing? Should we buy a television set for each child and keep him at home?

But before we all become educational revolutionaries, let us hear McLuhan once more:

The only thing I suggest we do is pay a lot of attention to what is going on and what is involved in these events. I would not dream of recommending any course of action until we know an awful lot about what is going on—diagnosis before therapy.[41]

It is impossible to avoid making comparisons between the approach represented by McLuhan and that represented by Bloom, Goodlad, and the many other workers in educational research who believe that we must emphasize specific, behavioral goals. Is McLuhan rejecting all goals other than the sort of thing that can be encompassed under some expression like "the training of perception"? Or is he merely rejecting linear or sequential sets of objectives which rest on the assumption that education is a simple process with some single goal? If this is the case, there would appear to be less conflict ultimately between the McLuhanites' view and the more conventional three-faceted view which we have adopted as a starting point for this Report.
To accept simultaneously, as a framework, the development of the child, the welfare of society, and the growth of knowledge, is another way of coming face to face with the complexity of the school's undertaking.

There seems little doubt that most educators—including most educational researchers—are far from the vanguard of McLuhanism. There also seems little doubt that McLuhanism is having some influence upon them and—through them—upon the schools.

Some Key Movements in Today's Curriculum Building

The field of curriculum building is such a complex one that it would be impossible to present in a Report of this kind an account—even in summary—of all significant movements which are currently exercising important influences on it. What we have chosen to do instead is to select from the literature three trends which have engaged the interest of a great many curriculum workers during the past few years: (1) the process approach, (2) the accommodation of individual differences, (3) the attempt to foster creativity.

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[31] Marshall McLuhan, "New Media and the New Education," *Canadian Communications*, (Summer, 1960), 48-55.

[32] "Forget 1066 and All That; Teach About Today— McLuhan," *Toronto Daily Star*, February 17, 1965.

[33] Dean Walker, "McLuhan Explains the Media," *Executive*, August, 1964, p. 25.

[34] Marshall McLuhan, Address to the Provincial Committee on Aims and Objectives in the Schools of Ontario, p. 2.

[35] *Ibid.*, p. 15.

[36] *Ibid.*, p. 4.

[37] *Ibid.*, p. 12.

[38] *Ibid.*, p. 15.

[39] *Ibid.*, p. 20.

[40] *Ibid.*, p. 10.

[41] *Ibid.*

1. The Process Approach

One of the most significant trends today within the field of curriculum building is the attempt to lead pupils toward the central notions or essential operations of subjects. This attempt is being made in a variety of ways.

a. Stimulating inquiry
Many educators are concerned that students should understand the "big ideas" or "major conceptual schemes"[42] of each subject and avoid becoming bogged down in subject-matter detail. These educators also place great emphasis upon the "processes" of subjects. The process approach to physics, for example, consists of an emphasis on what a physicist *does* rather than on the details of his results (the content of the subject). Very close to this is the interest of some curriculum workers in having pupils understand the logical structure of a subject—the nature of the mental operations engaged in by the historian, the sociologist, or the chemist, as the case may be.

> *When the school specialist speaks of* content, *he refers to the compendium of information which comprises the learning material for a particular course or a given grade. The information may consist of a related body of facts, laws, theories, and generalizations, as in a traditional science course, or a description of events, as in a history course. . . .*
>
> Process, *in contrast, refers to all the random, or ordered, operations which can be associated with knowledge and with human activities. There are a variety of processes through which knowledge is created. There are also processes for utilizing knowledge and for communicating it. Processes are involved in arriving at decisions, in evaluating consequences, and in accommodating new insights.*[43] *(Emphasis ours.)*

In the above quotation, Professors Parker and Rubin, both of the University of California, are defending what has become known as the process approach to academic subjects. They claim that this curriculum-building technique encourages active learning:

> *Where primary emphasis is upon content, the learner ordinarily functions in the passive mode. . . .*
>
> *Where the stress is upon process, the assimilation of knowledge is not derogated, but greater importance is attached to the methods of its acquisition and to its subsequent utilization. . . .*
>
> *Judgment as to the relative emphasis which should be assigned to process and content requires a preliminary commitment as to the fundamental purposes in educating the young.*[44]

Jerome Bruner of Harvard emphasizes his belief that every subject has a "way of thought":

> *There is nothing more central to a discipline than its way of thinking. There is nothing more important in its teaching than to provide the child the earliest opportunity to learn that way of thinking—the forms of connection, the attitudes, hopes, jokes, and frustration that go with it.*[45]

Parker and Rubin would seem to concur with Bruner that each subject has "its special way of looking at phenomena. . . ."[46] They maintain that subjects "differ dramatically in the intellectual problems they set for the learner, demanding relatively distinct methods of thinking, and employing processes which are often unique."[47] In addition, they claim "maximum transfer possibilities":

> *A number of cognitive specialists . . . contend that concepts—the pattern of relationship between . . . factual statements . . .—are realistically the only kind of learning that can be effectively transferred to more complex material at higher grade levels and to phenomena outside the school.*[48]

The task of the curriculum maker is to provide occasions for stimulating the same sort of inquiry which brought a subject into being and has sustained its growth. "If one only thinks of materials and content one can too easily overlook the problems."[49]

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[42] National Science Teachers Association, *Theory into Action in Science Curriculum Development* (Washington, D.C.: National Science Teachers Association, 1964), p. 17.

[43] J.Cecil Parker and Louis J Rubin, *Process as Content: Curriculum Design and the Application of Knowledge* (Chicago: Rand McNally & Co., 1966), pp. 1-2.

[44] *Ibid.*, pp. 2-3.

[45] Jerome S.Bruner, *Toward A Theory of Instruction* (Cambridge, Mass.: Belknap Press of Harvard University Press, 1966), p. 155.

[46] Parker and Rubin, *op. cit.*, p. 22.

[47] *Ibid.* It is interesting to note that unanimity on this point is lacking. James B.Macdonald of the University of Wisconsin, for example, claims that the structural concepts taught in certain new science courses are "more in the order of a structure of knowledge than a structure of one discipline. . . . And if this follows, then the disciplines are not truly separate, or have no distinctive structure." Macdonald sees this as a covert return to Dewey's "reflective thinking metaphor" and therefore as nothing new. ("Myths About Instruction," *Educational Leadership*, XXII [May, 1965], 576-77.)

[48] Parker and Rubin, *op. cit.*, p. 8. For another (and less enthusiastic) account of transfer possibilities, see David P.Ausubel, "An Evaluation of the Conceptual Schemes Approach to Science Curriculum Development," *Journal of Research in Science Teaching*, III (1965), 255-264.

b. "Process" and the subject
All this emphasis on generalization, processes, and structure seems on the surface to represent primarily a subject-centred approach to education. If so, it is certainly a new kind of subject-centredness. The acquisition of content (as a "compendium of information") is no longer the primary goal. Parker and Rubin even go so far as to redefine content in its "highest form" as process.[50] They emphasize, however, that "a preoccupation with process does not negate the desirability of being informed. . . ."[51] And it has been demonstrated, in the use of the process-centred PSSC physics course for secondary schools, that the acquisition of information does go on simultaneously—and in approximately the same degree—as in traditionally taught courses.[52]

c. "Process" and the child
In addition to its obvious—if altered—subject-centredness, the process approach seems also to offer a modified child-centredness, in that it is within the thought processes *of the child* that the "learning to learn" must take place. This is consistent with the rather Deweyan view, ascribed to Bruner and his associates, that the only kind of knowledge that is genuinely possessed by the child and genuinely useful to him is that which he discovers for himself by means of active inquiry.[53]

Some child-centred teachers, however, would probably reject the full implications of the process approach on the ground that its proponents have generally had little to say concerning the role, in learning, of the affective dimension of personality. Winnipeg principal Sybil Shack,[54] for example, has expressed strongly worded doubts of this kind. (And indeed, some process theorists seem to talk as though school populations were made up predominantly of the college-bound.)[55]

d. "Process" and society
Finally, the process approach has attracted considerable support from some who take a society-centred view of education. It is argued that facts learned at school are soon out of date, and that the ideal worker of tomorrow will be a highly adaptable person. He will be valued less for what he knows at any one time than for how readily he can learn something new.

e. "Process" and the psychology of learning
It is also interesting to examine the "structure" or "process" approach from the standpoint of the implications of what we know today about learning. Like many other proposals, this one requires a competent, committed teaching staff and an abundant and varied supply of easily accessible materials and devices. Clearly, too, it is not inconsistent with an emphasis on continuous progress. Much of the process approach seems to rest upon an adaptation of the old spiral curriculum idea (which concerned content) to the newer concern with process. However, some aspects of the approach have been strongly criticized from a psychological standpoint.[56]

f. "Process" and the integrated curriculum
In relation to the goal of an integrated curriculum, the structural approach has received both praise and blame. Goodlad has criticized the subject reform projects for not venturing outside their own fields. "There has been little recent effort to combine related fields; in fact, the current movement is predicated upon the discreteness of subjects and the importance of organizing and teaching them as separate disciplines."[57] Like Macdonald, Goodlad feels that "the search for fundamental elements in different subject fields seems increasingly to point towards methods, processes, or behaviors which appear not to be confined exclusively to one field but are shared by two or more."[58] He asks curriculum people to go beyond "the parochial limits of disciplines and children's abilities to learn them," and stresses the fact that the important processes are not unique to one discipline. "Observing, classifying, measuring, drawing inferences, speculating, and experimenting—these appear not to be unique to mathematics but to be equally appropriate to the enjoyment of literature and artistic performance—and to the full development of man's rational powers."[59]

On the long view, then, the possibilities for integration in the curriculum are seen (by some experts at least) to be improved, rather than harmed, by the new emphasis on structure. According to this school of thought, the structural approach might ultimately bridge gaps between traditional subjects by clearing away details and emphasizing basic similarities.

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[49] Bruner, *op. cit.*, p. 159.

[50] Parker and Rubin, *op. cit.*, p. 1.

[51] *Ibid.*, p. 11.

[52] But see Ausubel, *op. cit.*, p. 262, for a strong *caveat*, particularly in so far as the elementary school is concerned

[53] Parker and Rubin, *op. cit.*, pp. 8-9

[54] Sybil Shack, "Sybil Shack Says," *Monday Morning*, February, 1967, p. 8.

[55] See, for example, National Science Teachers Association, *loc. cit.*

[56] See, as an outstanding example, Ausubel, *op. cit.*

[57] Goodlad, *op. cit.*, p. 78.

[58] *Ibid.*, p. 68.

[59] *Ibid.*

g. The role of the scholar in the "process" approach
Curriculum revisions along process or structural lines also bear the hallmarks of other tendencies which have been making an impact in all the major subject fields.[60] For example, scholars in various fields have become involved in the development of curricula, and a long-overdue updating of content is under way.

There are some fundamental criticisms of the role scholars are playing.

The academic scholars can make a great contribution, and their judgment is of enormous significance, but it is appalling to find them inventing a teaching principle that is either unrealistic or inapplicable, or innocently advancing an instructional idea that for thirty years has been a routine gambit in the textbooks.[61]

Professor Macdonald[62] of the University of Wisconsin poses an even more fundamental question: "Structure is an after the fact description of the way knowledge can be organized by mature scholars . . . it does not necessarily follow that this is the way to organize knowledge in the instructional setting."[63]

Goodlad[64] also has reservations about subject reform from the top down. Sequence, he says, has not been effectively developed. Also, materials have not been designed for or tested with the culturally divergent, evaluation of the programs has been poor because there are no external criteria, and goals are not well defined. He adds that reform has been in subjects which have always been on the curriculum and that there is imbalance in the fact that reform in the sciences and mathematics has been better financed and better researched than reform in the humanities. Finally, although much has been done through in-service education, the impact on elementary teacher education programs has been delayed.

h. "Process" and individualized instruction
The structural approach is not in any way inconsistent with the principle of individualized instruction, but neither is it particularly relevant to that principle. Individualization can be applied to process learning just as easily as to content learning, but there is nothing about the process approach, per se, which requires individualized instruction or lends itself to it in any special way.

2. Individual Differences

A second prominent trend in curriculum building is toward greatly increased attention to individual differences. This is a movement which concentrates upon the individual child in his interrelationship with the school. Social aims would seem to enter the picture only through curriculum materials themselves and in the derivative sense that happier and more knowledgeable children should surely bring some ultimate benefit to society.

(a) Individual differences and the psychology of learning
The idea of paying closer attention to individual differences in curriculum building comes directly from the field of educational psychology. Indeed, it is one element that is absolutely necessary if we are to co-ordinate what we are doing with such implications for practice as can be derived from learning theory. Attention to individual differences is implicit in the notions of individualized instruction and continuous progress. Many of the newer organizational patterns of teaching have a concern for individual differences at their core. Recent research in creativity has also contributed to the concept of individual differences by confirming the uniqueness of each learner and the multiple dimensions in which human potential appears.

Emphasis on individual differences will obviously increase the need for the very best materials and devices. On teachers, too, it is making unprecedented demands. What such an emphasis will mean for teachers of the future, however, is unknown.
Some argue that the ultimate in attention to individual differences—completely individualized instruction—will cause drastic changes in the role of the teacher.

(b) Individual differences and the computer
Differences in individual learning rates have long plagued teachers, administrators, and curriculum builders. Yet Professor Patrick Suppes of Stanford University calls the notion of individual differences "the most important principle of learning as yet *unaccepted* in the . . . day to day practice . . . of the classroom."[65] Suppes has data to show how computer-based instruction can make the presentation, organization, and generalization of subject matter accommodate the individual learner by its immediate reinforcement and correction. He demonstrates how

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[60] *Ibid.*

[61] Parker and Rubin, *op. cit.*, p. 25 See also Herbert M.Kliebard, "Structure of the Disciplines as an Educational Slogan," *Teacher's College Record*, LXVI (April, 1965), 598-603, and also Fred M.Newman, "The Analysis of Public Controversy— New Focus on Social Studies," *School Review*, LXXIII (Winter, 1965), 401.

[62] James B Macdonald, "Myths about Instruction," *Educational Leadership*, XXII (May, 1965), 575.

[63] *Ibid.*

[64] Goodlad, *op. cit.*, p 54

[65] Patrick Suppes, "Modern Learning Theory and the Elementary School Curriculum," *American Educational Research Journal*, I (March, 1964), 79

the computer can determine optimal block size for learning and can promote transfer of learning. He also shows how computer-assisted instruction can sharpen learning because of its ability to adapt its pace to reaction-times of pupils on specific tasks. Suppes makes a strong case for the use of computers as a bridge between research in learning and implementation of research findings.

Suppes' work strongly suggests that with computer-assisted instruction, elementary pupils can do advanced work earlier than we usually expect. Moreover, each student can proceed at his own optimal rate, competing only with himself. Apparently, also, individual learning styles can be catered to.[66]

In reviewing research on perception, Professor Marion Jenkinson[67] of the Ontario Institute for Studies in Education highlights the fact that people perceive in their own characteristic ways. A person may be basically an analyzer or a synthesizer; he may have a preferred sense. She suggests that children might be grouped according to whether they learn best visually, aurally, or by touch. And another writer[68] reports on a school in Saskatoon where Grade 1 entrants were classified and taught according to their preferred sensory mode.

Those who question Suppes' recommendations are likely to point out that although there is fast interaction with the computer, human interaction may be more important for some students. (But Suppes does not, of course, suggest that an elementary school pupil should spend his entire day at the computer terminal.)[69] Critics are also prone to question the objective of getting children to learn more—at least "more" in the sense of more *content*. They may also worry about the extent to which CAI can take into account the learner's unique background and motivation. (Suppes admits this is a problem—"a deep and complicated one. . . .")[70]

(c) The problems of the culturally divergent

Other contributions to our understanding of individual differences have come from the massive amount of writing on the culturally different. There have been many moves[71] toward reshaping curricula to fit particular growth patterns, background experiences, and values which went largely unrecognized until recently. Research in this field has underlined the importance of the language development and self-concept formation of each child.

(d) A departmental stance

Although curricula have traditionally been designed "for groups rather than for individuals,"[72] the Ontario Department of Education has given dramatic recognition to individual differences in its most recent curriculum outlines. "No specific assignment of topics to grade levels is desirable."[73] "There will be wide variations in rates at which individual children arrive at a stage of mastery."[74] "Each child is always ready to learn something."[75]

3. Fostering Creativity

A third important trend in present-day education is the drive toward fostering creativity in children.[76]

People have frequently wondered at the fact that some school failures enjoy highly successful careers. Examples considered in one key study of this phenomenon range from Hitler to Einstein, Dali to Churchill.[77] The implication has seemed to be that some people possess talents which do not come into play within a standard school environment. During the past five years educational journals have been placing very strong stress on such factors, generally under the rather imprecise label of "creativity."

(a) Who is creative?

The precise meaning of the term "creative" is a source of disagreement. To most laymen, the word would seem to be an adjective applied mainly to artists, occasionally to brilliant scientists. The majority of recent researchers, however, have used it in a broader sense—to describe abilities which appear to be possessed, in one degree or another, by many children and adults.

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[66] Patrick Suppes, "The Uses of Computers in Education," *Scientific American* (September, 1966), p. 220.

[67] Marion Jenkinson, "Some Implications of Psychological Research for Elementary Education," *Canadian Education and Research Digest*, VII (September, 1962), 195-204.

[68] Walter W.Worth, "The Changing Curriculum of the Elementary Schools," *Canadian Education and Research Digest*, VI (December, 1966), 308.

[69] Suppes, *loc. cit.*

[70] Patrick Suppes, "The Computer and Excellence," *Saturday Review*, January 14, 1967, p. 46.

[71] See, for instance, James L.Olson and R.G.Larson, "Experimental Curriculum for Culturally Deprived Kindergarten Children," *Educational Leadership*, XXII (May, 1965), 553-58.

[72] Fred T.Wilhelms, "The Curriculum and Individual Differences," *Individualized Instruction*, Sixty-first Yearbook of the National Society for the Study of Education (Chicago: University of Chicago Press, 1962), p. 62.

[73] Ontario Department of Education, *Interim Revision Mathematics*, Curriculum PI, JI (Toronto: Ontario Department of Education, 1966), p. 1.

[74] *Ibid.*, p. 2.

[75] Ontario Department of Education, *Interim Revision English*, Curriculum PI, JI (Toronto: Ontario Department of Education, 1966), p. 12.

[76] See, for example, J.P.Guilford, "Three Faces of Intellect," *American Psychologist*, XIV (August, 1959), 469-479.

[77] Victor Goertzel and Mildred G.Goertzel, *Cradles of Eminence* (Boston: Little, Brown and Co., 1962), p. 241.

Some researchers now claim that everyone is capable of creative thinking at some level.[78] It has recently been demonstrated, for example, that self-teaching devices can be used to instruct both children and adults in certain thinking techniques which make them two to three times as effective as untrained persons "in readiness to ask relevant questions in solving problems, in the number of ideas and hypotheses generated, in quality and originality of ideas, and in actual achievement of solutions."[79] Ausubel[80] questions the relevance of such findings to the task of identifying potential for creativity in the narrower sense. He seems to recommend a return to something close to the layman's definition. But the fact remains that a good deal of interesting experimental work has been done on the basis of the broader concept.

(b) The creative child at school

A seminal piece of work is a study by the well-known psychologists Getzels and Jackson.[81] Values of persons classified as highly intelligent were compared with those of persons classified as highly creative. The high-IQ population appeared to accept externally derived conventional values, whereas the high-creativity people demonstrated a more independent, sometimes rebellious, attitude. Other investigators[82] compared students of high and low intelligence and high and low creativity. Students who rated high on both scales were successful academically, popular, and were high in confidence and self-control. High IQ with low creativity made for school success accompanied by narrow vision. Students with high creativity and low IQ scores "were the worst placed, even worse than those low on both scales; they felt inadequate and needed a great deal of support."[83] There is some evidence, then, that today's schools may be short-changing many creative children.

The emphasis on creativity is at once directed toward the child, the society, and the growth—if not the absorption—of knowledge. Moreover, in its own particular way, each one of the recommendations emerging from our brief account of learning theory may be expected to play a part in the stimulation of the child's creativity. It appears that creativity can be fostered by all of the approaches suggested by our present understanding of the learning process—individualized instruction, continuous progress, and an integrated curriculum. It should also be promoted by the presence of competent, committed teachers and by the use of a variety of materials and devices designed to appeal to varied interests and abilities.

[78] Carnegie Corporation, *Report* (New York: The Carnegie Corporation, 1965), pp. 39-40.

[79] *Ibid.*

[80] David P. Ausubel, "Fostering Creativity in the School," *Proceedings: Centennial Symposium "How Children Learn,"* A Joint Project of Phi Delta Kappa, University of Toronto, and the Ontario Institute for Studies in Education, Toronto, 1967, p. 43

[81] Jacob W. Getzels and Philip W. Jackson, *Creativity and Intelligence: Explorations with Gifted Students* (London Wiley, 1962), p. 239

[82] M.A. Wallach and N. Kogan, "A New Look at the Creativity-Intelligence Distinction, "*Journal of Personality*, XXXIII (September, 1965), 348-369.

[83] D.C. Blue, "A Review of Recent Studies of Intelligence, Talents, Creativity, and Aptitudes, and their Implications for Education," Paper presented to the Canadian Association of Professors of Education, Sherbrooke, P.Q., June, 1966, p. 5.

Helping pupils make maximum use of their abilities requires a school organization that is flexible and that encourages friendly interaction among teachers and pupils.

Lord Lansdowne Public School, Toronto.

Photo by Bob Bocking. Courtesy Teaching Aids Department, Board of Education for the City of Toronto.

Chapter 5
Present Trends in the Elementary School

The four preceding chapters have been devoted to consideration of the objectives of education in the elementary (K-6) school and to the nature of learning, teaching, and curriculum as they apply in that setting. These chapters were intended to serve as the conceptual foundation for this Report.

We now turn our efforts from an attempt at theoretical understanding toward an essay in practical description. In this Chapter we shall consider the impact of new knowledge on current elementary school practice.

Our selection of trends is intended to be comprehensive but in no way exhaustive. Each is in some way and to some extent a response by educators to the complexities discussed in the first four chapters. Furthermore, each one, regardless of existing proof of worth, has attracted enough attention to remove it from the category of wishful thinking. Each, therefore, must be regarded as a significant ground swell in elementary education. Some, no doubt, may wither; others may have deep and long-term effects. Together, they form a collage which is the current response of systems of formal education to the social and intellectual ferment surrounding them.

It must be remembered that the new programs we shall mention are only an initial and small-scale response to what is happening—and will happen—in our society. We have chosen to consider only those trends which are presently being implemented at the level of school practice. We have not constructed imaginary trends, nor have we, in general, tried to develop logically possible extensions of existing trends. Furthermore, we have not attempted to describe a school program in which many or all of the existing trends are fully implemented. We believe that attempts should be made to synthesize alternative school programs, and that such syntheses should be designed so that they can be judged against a set of common criteria. However, we were unable to undertake such studies and have therefore confined ourselves to outlining a number of practices which are typical of the ones new schools should be able to accommodate.

Consciousness of the Affective Dimension of Personality

The idea that children have feelings—and that those feelings are important—is certainly not new. It is surely obvious to anyone who has ever observed children at school, at home, or at play that youngsters can experience love, hate, anxiety, and confidence, and that they can have a consciousness of dignity or personal worth. What is new is the growing awareness among educators of the importance of these feelings in relation to the learning process.

1. Negative Feelings and Pupil Failure

Benjamin Bloom and his associates[1] have played a key role in the creation of this awareness of the affective dimension. So also have writers like John Holt[2] (a Colorado teacher and writer) who emphasize the contribution of negative feelings to pupil failure. Children, says Holt, may be so afraid of seeing themselves as failures that they seek refuge in incompetence. "Not only does demonstrated incompetence reduce what others expect and demand of the child, but it also reduces what he expects from or even hopes for himself."[3]

Evidence to support Holt's position has been available for some time. Emotional disturbances associated with school failure were reported as the most common symptom in a study of 800 academically retarded children.[4] Apparently competitive emphasis in the school produces negative feelings in many children, and these negative feelings seem to make it difficult or impossible for them to make full use of their academic abilities.

2. The Emotional Climate of a Classroom

In an attempt to specify what it is about a classroom situation that produces positive or negative feelings among children, Withall[5] attempted to measure an elusive thing called "emotional climate." He began by rating teachers' statements made in class on a "supportive-disparaging" scale. He then measured pupils' feelings about their classes and found a strong positive relationship between the feelings of pupils about their classes and the "supportiveness" of what their particular teachers had said. Clearly, what teachers say makes a difference in the way children feel about school.

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[1] Benjamin S.Bloom, David R.Krathwohl, and Bertram B.Masia, *Taxonomy of Educational Objectives: the Classification of Educational Goals,* Handbook II: *Affective Domain* (New York: David McKay, 1964).

[2] John Holt, *How Children Fail* (New York: Pitman, 1964)

[3] Paul Nash, Review of *How Children Fail,* by John Holt, *Harvard Educational Review,* XXXV (Summer, 1965), 379.

[4] W.C.Ryan, *Mental Health Through Education* (New York: The Commonwealth Fund, 1958).

But "climate" is affected by many factors in addition to what is said. The teacher's tone, posture, and facial expression provide non-verbal cues for the pupils. In crucial social situations involving trust or honesty, non-verbal cues are often more important than verbal ones.[6] This is especially so when there is a cultural or a social class difference between pupils and teachers. There is evidence that "real attitudes" show through regardless of the words used,[7] and that lower-class youngsters depend heavily on non-verbal cues in school situations.[8] Similarly, many New Canadian children in Metro must surely be heavily dependent upon impressions obtained in this way.

Despite the significance of non-verbal cues for feelings and learning, verbal communication is the prevailing mode in schools. According to a recent study,[9] two thirds of the time in an average classroom is spent in talking. Of this talking, two thirds is done by the teacher, and two thirds of the teacher's statements have been labelled by one well-known researcher as "opinionated, directional or critical."[10] Where so much talking goes on, the difficulties of culturally different children are probably intensified. It may well have a negative effect upon their learning performances.

The same study has also been used to illustrate the extent to which the teacher and teaching are now dominant and to justify an attempt to put the emphasis, instead, on the learner and learning. At the practical, everyday classroom level, the emphasis seems still to be on teaching—verbal teaching. Shifting the accent to learning will be a major task—and one that will necessarily involve taking account of pupils' feelings.

A hundred years ago it was widely—almost universally—assumed that the child must learn to adjust his feelings to the exigencies of the school situation. Today, by contrast, there seems to be a growing consensus that schools and teachers must adjust their programs and methods to the feelings of the child.

Professor Robert S. Fox of the University of Michigan concludes a summary of relevant literature as follows:

> *For the large majority of pupils, the evidence is that he who sees himself as well-liked by his peers, finds his values and attitudes consistent with those of his peer group and his teacher, feels valued and supported by the teacher and by his parents, and has opportunities to relate constructively to children who are both older and younger than he, will develop a positive concept of self and will utilize his potential for academic achievement at a higher level than will the pupil who is less positively related to the social environment.*[11]

According to Fox, there is definite evidence that children learn more effectively in groups whose size is determined by the nature of the task at hand,[12] in "diffusely structured" (as opposed to cliquish) classes,[13] in democratically organized classes,[14] and in situations in which teacher-pupil relationships are friendly.[15] The evidence, in short, is in favor of situations which foster a positive self-concept.[16] Helping pupils make maximum use of their abilities, then, requires a school organization that is flexible, that discourages cliquishness, and encourages friendly, democratic interaction.

Special Education

Full consideration of current research and trends in special education is beyond the scope of the study. However, several trends in special education have major import for the regular school system, and these, therefore, must be dealt with briefly at this point.[17]

1. Special Education and its Broader Effects

Special education facilities have developed because conventional school programs, as we now know them, have always been inappropriate or ineffective for many children. Provision for children who are physically, mentally, or socially different is not easily made in regular classrooms. Special provision for these children has been increasingly emphasized since the early 1900's.

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[5] John G.Withall, "Development of the Climate Index," *Journal of Educational Research*, XLV (October, 1951), 93-100. (Other efforts, in the tradition of Halpin and Bales, have also been made to measure climate.)

[6] Paul Torrance, "Teacher Attitude and Pupil Perception," *Journal of Teacher Education*, XI (March, 1961), 97-102.

[7] *Ibid.*

[8] Basil Bernstein, "Social Structure, Language and Learning," *Educational Research*, III (June, 1961), 163-76.

[9] Ned Flanders, "Analyzing Teacher Behavior," *Educational Leadership*, XXX (December, 1961), 174-75.

[10] *Ibid.*

[11] Robert S.Fox, "The Social Environment and the Learning Situation," *SER2 Environmental Evaluations* (Ann Arbor, Mich.: University of Michigan, Architectural Research Laboratory, 1965), pp. 177-178.

[12] *Ibid.*, p. 170.

[13] *Ibid.*, p. 169.

[14] *Ibid.*, p. 172.

[15] *Ibid.*, p. 173.

[16] *Ibid.*, p. 177.

[17] Special education receives more extended treatment in Chapter 8, where user requirements are also set out.

One important effect of this trend has been its impact on the education of "average" children. The logical conclusion of the philosophy of special education is the acceptance of individual differences. The idea is that *every* child is unique, if only in the form of his ignorance or the characteristics of his distinctive learning tendencies. From this standpoint, special education can be seen as having played a catalytic role in the development of such general educational trends as nongrading or continuous progress.

A second effect is the stress on compensatory education for children often referred to as "socially disadvantaged." (This includes the children of non-English-speaking immigrants.) "Disadvantaged" children make up a significant proportion of the Metro school population (possibly 20 per cent). Implementation of programs for them demands specially enriched environments and specially trained staff.

For many years in Metropolitan Toronto, elementary (K-6) schools have been assuming an increasing amount of responsibility for providing the most appropriate educational opportunities for *all* children, for facilitating maximum development of individual capabilities, and for laying the groundwork which will later help youngsters to take their place in society.

2. Classifications of Exceptional Children

The firm belief that the exceptional child should be accorded the same rights to an education as other children follows directly from our society's respect for individual worth. Some exceptional children are intellectually or creatively gifted. Others are mentally retarded, blind or partially sighted, deaf or hard of hearing, orthopedically or physiologically handicapped, neurologically impaired, emotionally disturbed, or culturally disadvantaged. Such children need special provisions. Of course, each and every child should be given individual attention, but "fortunately . . . not every child requires special educational provision."[18]

An interesting new approach to the selection of children requiring special education (except as that term applies to special treatment of the gifted) is the concept of "educationally handicapped children." A child is generally considered to be "educationally handicapped" if he is "unable by certain local standards to meet minimal expectations in the general curriculum, or if he finds the curriculum inappropriate and intolerable."[19] Here the emphasis is on significant, comparative educational deficiency, rather than on the precise nature of the factors that may contribute to this deficiency.

3. Purposes of Special Education

By and large, special education for the handicapped is a "training-oriented discipline." Its aim is to help the child to learn to deal successfully with his environment and "to cope with his handicap and become economically and socially self sufficient."[20] But special education programs do not stop at the treatment of differences. A handicapped child is, first and foremost, a child, and all our efforts should be aimed at the development of his whole person. As the Ontario School Inspectors' Association puts it, "The school program should be concerned with the development of attitudes, adequate personal habits, health habits, safety habits, working habits and expressive skills of language."[21]

These concerns are identical with those for average children.

The next trend which we shall consider—evaluation—is one which has gained greatly from research and practice with exceptional children.

Evaluation

Evaluation is an integral part of the teaching-learning process in schools. It is the systematic collection of evidence about student performance. This evidence is used

(1) to assess the effectiveness of instruction,
(2) to compare a pupil's performance with group standards,
(3) to provide a basis from which the student may learn self-evaluation,
(4) to build a cumulative record of the child's development,
(5) to assist in determining optimal grouping arrangements,
(6) to construct reports to parents, and
(7) to improve future teaching.

1. The Role of Testing

Much evaluation takes the form of testing. This may take place informally (by means of verbal questioning or observation) or formally (by means of examinations and standardized tests). Much testing serves to direct attention to previous learning and to provide pupils with opportunities to use what they know. Testing can thus be a teaching method as well as an evaluation device.

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[18] W.B Dockrell, "Provisions for Exceptional Children," *The Canadian School Principal*, ed. A.W.Reeves, John H.M.Andrews, and Fred Enns (Toronto: McClelland and Stewart Ltd., 1962), p. 222.

[19] Roger Reger, "Concepts in Special Education," *Education*, LXXXVII (February, 1967), 330.

[20] Marvin A.Wirtz, "Something for the Special Child," *American Education*, I (September, 1965), 20.

[21] Ontario School Inspectors' Association, *The Education of Children with Handicaps*, Sixteenth Yearbook of Ontario School Inspectors' Association, 1960-61 (Toronto: Copp Clark, 1962), p. 167.

Two bases for concern about evaluation are the child-centred approach to education and nongrading. Concern with the whole child and his self-fulfillment draws attention to evaluation. It is relatively easy to evaluate manners or reading competence, but extremely difficult to measure creative thinking or personal development. Nongrading demands continual assessment of a student's interests and achievement in order to establish his direction and rate of progress. To design appropriate learning experiences for him, it is necessary to know what the child can do as well as what he wants to do.

Overall evaluation is an awesome responsibility for any one teacher. The trends toward co-operative teaching and open-space schools make it much more likely that several people will share in the evaluation process. This development could reduce pressure both on children and on teachers and thereby contribute to the improvement of education.

2. *Diagnostic Testing and Pupil Self-Evaluation*

Several other trends are apparent in the area of evaluation. Standardized tests, although not new, are being continually refined. Many of the standardized reading and mathematics tests are now designed and used for diagnostic purposes. These tests indicate the meaning of specific types of error and suggest remedial programs. They can be especially useful in team teaching situations as an aid in grouping children. Pupil self-evaluation is another trend. This type of evaluation is built into programmed instruction. Here, the pupil evaluates his every response in order to determine his next step. As generally used in K-6 schools, however, the term refers to a formalized type of self-reporting. This approach to evaluation is an attempt to involve the child in evaluation in order to foster objective self-assessment and to promote a balanced, positive self-concept. Pupil self-evaluation is intended to provide direction both to the student and to the teacher in planning future activities.

3. *Need for Co-ordinated Effort*

Conventional evaluation devices are not likely to be discarded. The full range of such methods as tests, rating scales, interviews, and anecdotal records will probably continue to be used in most schools. All of these are valuable if skilfully employed and related to particular educational goals. But the devices selected must suit the specific educational purposes of the teacher. The teacher must know what is to be evaluated, the limits and peculiarities of each device, and the proper uses for the evidence obtained.

Considering the importance and complexity of evaluation, it is apparent that the diagnosis of the developmental and educational needs of a group of children requires the co-ordinated effort of a team of trained professionals.

The Rediscovery of Discovery—The Experience Method

Educators are fond of compiling lists and categories. One of the more useful efforts of this kind is a list[22] of conditions that enhance learning. Three of its thirteen points are relevant here:

> *(1) Learning takes place more readily if the child accepts as useful and important to him the activities in which he is expected to engage.*
> *(2) Learning is more effective if it has satisfying emotional content—if feeling is supportive of thinking.*
> *(3) Firsthand experience makes a deeper impression . . . than does vicarious experience.*[23]

1. *Language-Experience Programs*

The above three points are thoroughly embedded in the integrated language programs which have been appearing during the last few years. It is now widely believed that the nature and quality of a child's experience are crucial factors in the beginning stages of reading. The general intent of these courses is, therefore, to envelop a child in language experience, to the end that language will continuously be absorbed from his activities.

> *For young children, English is not a subject at all, but an activity permeating their lives. It enters into individual experience and social relationships and provides us with opportunities of finding or creating the most alive, poignant, and energetic expression we can of our experiences, and in so doing forms a part of the experience itself.*[24]

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[22] See Camilla M. Low, "Selecting and Evaluating Learning Experiences," *Guidance in the Curriculum*, 1955 Yearbook, Association for Supervision and Curriculum Development (Washington, D.C.: Association for Supervision and Curriculum Development, [NEA], 1955).

[23] *Ibid.*, pp. 53-65.

[24] *A Programme for Research and Development in English Teaching*, Working Paper No. 3, The Schools Council (England), quoted in Ontario Curriculum Institute, *Reading, A Demonstration Project* (Toronto: Ontario Curriculum Institute, 1966), p. 4.

The integrated language program is based on the belief that the content of a child's experiences and his interests provide the most effective avenue for leading him into the world of printed language.[25] In the initial stages, the teacher assists the child in telling about his own activities and thoughts through the new medium of writing (printing). The teacher actually does the printing for the child; but the child knows, nevertheless, that he has created his own reading materials. Thus, the congenial and dynamic relationships between verbalizing, writing (printing), and reading are recognized.

The experience approach in learning appears to be of special value to teachers working with non-English-speaking and culturally disadvantaged children. These children do not benefit sufficiently from the more traditional methods of learning the language arts. They have no way of coming to grips with the standard lessons in most curriculum manuals and tests. "The printed word, to become meaningful for . . . children belonging to special groups, must reflect their own experiences and thoughts—quite a different universe from that of the more typical child for whom the standard lessons were originally devised."[26] The controlled or restricted vocabulary of the basal readers may perhaps be adequate for pupils from middle-class homes who resemble the average children on whom the readers were originally standardized. But this vocabulary is inappropriate for children whose backgrounds are different. Initiating literacy through utilizing words in contexts familiar to these children appears to be a more promising approach.

Finally, this new kind of language program also can benefit other groups such as adult illiterates.[27]

2. *Elementary School Science*

Innovations in elementary school science are designed to promote both a love of inquiry and encounters with various scientific stimuli.[28] Science classes must "provide pupils with experiences that are different from their usual ones."[29] Experiences having to do with the substances that may be manipulated are appealing. These substances can be soft or hard, elastic or inelastic, more dense or less dense, brittle or ductile, chemically active or inert.[30]

Another type of experience is provided by the introduction of devices such as magnifying glasses, microscopes, and telescopes. "Thermometers, spring scales, voltmeters, graduated cylinders, and stroboscopes make possible the discovery of quantitative equivalences."[31] An express elevator with sudden stops and starts may help in introducing the concept of weightlessness, and a merry-go-round can become a rotating platform on which the laws of nature may be seen in a new perspective. The motion picture may serve to exhibit the behavior of animals and minute organisms or the unfolding of a plant.[32]

Such experiences are direct. Pupils are given time and freedom to perceive, reflect, compare, and connect. Under the teacher's guidance, pupils can integrate new experiences with what they already know and thus discover new concepts.

Nongrading

This educational trend is an organizational innovation. It refers to deliberate deviation from the conventional graded approach to school organization.
To understand the significance of nongrading, it is necessary first to consider the nature of a graded school.

1. *Characteristics of Graded Schools*

The graded system originated in Quincy, Massachusetts in 1848. It was an attempt to provide, as efficiently as possible, a standard education for all. The graded system has at least eight important characteristics:

(a) Children are divided and classified according to age and attainment, with a teacher having a single grade, or as few grades as possible, within a self-contained classroom.
(b) Graded organization is seen as making efficient use of teacher time, in that the class is instructed as a whole.
(c) The course of study is carefully planned in detail for each grade. Graded series of textbooks are used. Tests designed for a particular grade are given in that grade.
(d) Children are seen as making a set rate of progress throughout the course of study. The rate of progress in each grade is specified as that which

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[25] *Ibid.*

[26] Gertrude H H.Hildreth, "Experience-Related Readings for School Beginners," *Elementary English,* XXXXII (March, 1965), 293-295.

[27] *Ibid.*, p. 295.

[28] Joseph McVicker Hunt, *Intelligence and Experience* (New York: The Ronald Press, 1961).

[29] Robert Karplus, "Science," *New Frontiers in Education,* ed. Fred Guggenheim and Corinne L.Guggenheim (New York: Grune & Stratton Inc., 1966), p. 122.

[30] *Ibid.*

[31] *Ibid.*

[32] *Ibid.*

is suitable to the majority of "normal" children.
(e) Children who do not meet the "standards" for promotion are retained for another year.
(f) Grade levels signify definite levels of achievement.
(g) Achievement range is controlled by promotion policy. Since pupils who do not meet the grade standards are retained, it is assumed that the pupils who pass must have a quality of sameness in factors pertaining to school work and attainment.
(h) Individual differences are to be reduced as much as possible in each classroom. This is usually attempted through homogeneous class grouping and subject grouping. Achievement is judged by the teacher on the basis of grade tests.[33]

2. *Criticisms of Graded Schools*

Despite occasional reactions to what critics have called regimentation or "lock-step," the graded system has become firmly established. In recent years, however, educators have criticized it with increasing frequency. In their book *The Non-graded Elementary School,* Professors John I.Goodlad of the University of California and Robert H.Anderson of Harvard point out the influences that have gradually brought discredit upon the graded school and which have cast favor upon the concept of nongrading or continuous progress. The factors listed are

(a) Dewey's concern for the health, personality, and adjustment of the child,
(b) interest among educators in human development and individual differences—physical, emotional, social, and intellectual,
(c) evidence concerning negative effects of non-promotion,
(d) the idea of organizing content to promote inductive and deductive thinking.[34]

Dewey's influence has already been discussed in Chapter 1, and the impact of newer theories concerning re-organization of content has been treated intensively in Chapter 4. These topics will not, therefore, be developed in this Chapter. The concept of individual differences (treated in Chapters 2 and 4) will be referred to briefly, however, because of the directness of its relevance to nongrading. For the same reason we shall also make reference to the effects on non-promotion.

Through analysis of classes at various grade levels, Goodlad and Anderson have developed certain generalizations concerning individual differences. They have found that at Grade 1 there is a range of three to four years in readiness, that the initial spread in abilities approximately doubles by the end of elementary school, and that the achievement patterns of individual children differ markedly from learning area to learning area.[35]

Gross variability among children persists even in classes contrived to be closely homogeneous in chronological age, and it is reduced only moderately through so-called ability grouping.[36] Indeed, it has been pointed out that "the only way a homogeneous group can be kept together is to teach them nothing, for when instruction begins some students learn a little, others learn a lot."[37] These facts and their implications are playing a significant part in the current educational trend toward nongrading.

Goodlad and Anderson have also identified the negative effects of non-promotion as a contributing factor in the trend to nongrading. Non-promotion has traditionally affected a great many first-grade children. Such grade repetition is caused by failure to meet the expectations of a teacher, a school, and/or a school system. But it is well known that the basis of non-promotion may vary from system to system, school to school, even teacher to teacher.

Teachers give a variety of reasons for retaining pupils—poor attendance, lack of reading skills, entrance age, immaturity, and a variety of emotional conditions.[38] Males (more frequently than females), New Canadians (more than native-born Canadians), and children from disadvantaged homes (more frequently than those from enriched homes) are consistently faced with non-promotion in elementary schools. Non-promotion is designed as an adjustment mechanism for children who do not come up to grade standard. Yet it is evident that grade repetition does not produce the benefits assumed for it. Retained children seldom achieve more during their year of repetition than equally slow-learning age mates who are promoted. In fact, retainees often do less well the second year in a grade.[39] Nor is it any more defensible to meet the problem simply by promoting practically everybody every year. Placing a child in increasingly impossible classroom situations can also cause harm.

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[33] Based on a list presented in James F.Lindsey, "A Study of Provisions for Meeting Individual Differences through Graded School Organization" (unpublished dissertation, University of California at Berkeley, 1966).

[34] John I.Goodlad and R.H.Anderson, *The Non-graded Elementary School* (New York: Harcourt, Brace & Co., 1959), pp. 51-52.

[35] *Ibid.*, pp. 27-28.

[36] F.J.Gathercole, "Curriculum and the Child," *Arbos* I (September, 1964), 24-28.

[37] Walter W.Cook and Theodore Clymer, "Acceleration and Retardation," *Individualizing Instruction*, Sixty-first Yearbook of the National Society for the Study of Education, Part I (Chicago: University of Chicago Press, 1962), p. 190.

[38] Bill Clark, "Emotional Problems: A Major Factor in Retention," *Southeastern Louisiana College Bulletin*, XVI (January, 1959), 17-19.

[39] Goodlad and Anderson, *op. cit.*, p. 205.

Especially in the early grades, labelling of some children as failures, either at the end of a year (by non-promotion) or on a day-to-day basis (by automatic promotion), is now believed to have detrimental effects on their self-concepts and thereby to contribute to poor academic performance.

Various attempts have been made by the schools to overcome the weaknesses inherent in the graded system. Through departmentalization, school systems have tried to provide better teaching by subject-specialists teachers. To narrow the range of abilities, they have introduced streaming.[40] Units of work rather than grade divisions are a further attempt to eliminate the grade hurdles. Acceleration, enrichment, special classes for slow or retarded students, child guidance clinics, remedial instruction, school libraries, and classes for New Canadians are other innovations intended to improve the quality of education. Many have had encouraging results, but all have been impeded by basic flaws of the graded system.

3. Nongrading as an Alternative

As was suggested in Chapter 2, the real alternative to a graded school is nongrading or continuous progress. The arguments in favor of this type of organization are cogent. Goodlad has expressed some of them:

> *Organizationally, a non-graded school is one* [*in*] *which the grade levels and grade labels representing years of vertical progress are replaced by a plan of continuous upward progress. Conceptually it is intended to eliminate the promotion-non promotion, adjustment mechanism of graded schools; to raise the ceilings and lower the floors of attainment expectancies for learners, thus encompassing their individual differences;. . . to encourage the utilization of content and materials in accordance with pupil individuality; and to force pedagogical attention to individual differences and the individual.*[41]

Within the nongraded school teachers can allow children to progress slowly without risk of failure. A nongraded system allows for generally slow and generally fast children. It also allows for slow and rapid periods of development within each child.[42]

In effect, nongrading allows the teacher flexibility in responding to the needs, aspirations, and interests of children. It can be successful only in proportion to the sensitivity of the teacher in providing for the needs of the individual child. "The non-graded school. . . . is for those educators who would make use of present-day insights into individual differences, curriculum, and theories of personality, and who would commit themselves to a comprehensive revision of elementary education."[43]

Nongrading obviously seems to offer many advantages for many children. Properly implemented, it can allow each child to develop at his own (perhaps uneven) rate throughout his school years. Its main potential for failure lies in the fact that even where organizational form changes, quality of teaching may not. Unless there is simultaneous change in other areas, benefit may not be realized. Some schools have established a levels system of reading or mathematics achievement. But such programs are sometimes fraught with danger. Nongraded programs of this nature can even "carry the old conception of curriculum to a new point of impoverishment," and become more rigid than the structures they were devised to supplant.[44]

W.R.Wees, a well-known Canadian publisher, is even more direct in his criticism of pseudo-nongrading:

> *By ungrading in the elementary school we mean that we break up a big grade into little pieces, and to prove that we have ungraded our classes we don't call the little pieces grades, we call them units. Thus we have, say, nine little grades instead of one big one. Ungrading grades in this way is much the same as unchanging change.*[45]

Wees mentions, also, that the results of a number of research studies on achievement in nongraded situations have been less than satisfying.[46] Nevertheless, much professional opinion at the moment appears, in general, to be favorable.

One researcher has listed 43 elements required for a fully developed nongraded program.[47] There seems to be consensus that educational payoff from nongrading can be expected only if other promising innovations are implemented concurrently. In light of this, it is encouraging to note the claim that nongrading itself provides an environment which facilitates development and testing of other new approaches to learning.

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[40] J.Furcall, "The Non Graded School and the Implications for Team Teaching," *Educational Record*, LXXX (April, 1965), 75-79.

[41] John I Goodlad, "Cooperative Teaching in Education Reform," *National Elementary Principal*, XLIV (January, 1965), 10. Copyright 1965, Department of Elementary School Principals, National Education Association All rights reserved.

[42] Gathercole, *op. cit.*, p. 28

[43] Goodlad and Anderson, *op. cit.*, p. 216.

[44] A.Frazier, "Needed: A New Vocabulary for Individual Differences," *Elementary School Journal*, LXI (February, 1961), 263.

[45] Wilfred R Wees, "Keeping in Step with the Times," *Monday Morning*, May, 1967, p. 9

[46] *Ibid.*

[47] Robert F.Carbone, "Criteria for Evaluating a Non-Graded School," *Educational Technology*, VI (August 15, 1966), 12-19.

Team Teaching

One widely known trend away from the conventional one-teacher, 35-child, enclosed-classroom type of school organization is team teaching. While the term "team teaching" appeared about 1957, the concept seems to be an extension of a number of earlier trends in elementary education.

1. Historical Background and Definitions

The origins of team teaching have been traced[48] to Andrew Bell in Madras, India, in the late 1700's. Bell originated the monitorial (students as tutors) system in response to a shortage of qualified teachers. Joseph Lancaster later introduced the system to London, whence it spread to North America. The Gary or Platoon Plan of the early 1900's is cited as another progenitor of team teaching.[49] No doubt many other such plans have been predecessors of today's differentiated instructional grouping schemes.

The first of today's kind of team teaching projects was begun in 1957 in Lexington, Massachusetts.[50] This project was the first of a series of experimental programs set up by Harvard University through its School and University Program for Research and Development (SUPRAD). The idea has spread rapidly during the past decade. By late 1964, a survey showed that 76 elementary school systems with enrolments of 12,000 or more were doing some team teaching. For the survey, team teaching was defined as a situation in which "students have more than one teacher, but (as opposed to departmentalization) the teachers are organized as a team for the instruction of students. The team engages in teaching one or more subjects with specific duties and responsibilities assigned to each member."[51]

A more restrictive definition of team teaching is offered in NEA's *Schools for the Sixties:*

> *Team teaching is one horizontal scheme that combines considerations of children, curriculum, and teacher qualifications in establishing class groups. . . . Communication might be improved if the term were used only to refer to cooperative teaching that has all three of the following characteristics: (1) a hierarchy of personnel—team leader, master teacher, clerk, and so forth; (2) a delineation of staff function based on differences in personal interests and preparation, or on the kinds of learning activities that have been planned; (3) flexibility in grouping the students who are under the supervision of the teaching team.*[52]

It would be redundant to offer here either an extended set of definitions or a series of examples of what is being done under the team-teaching label. Purists would maintain that team teaching necessarily involves some combination of large group instruction, small group instruction, and individual study. However, definitions and examples are numerous and varied.[53] Team teaching is being tried in all grades, in all subjects, and via almost all possible arrangements of grades, subjects, and teachers. The variety of combinations of grades, subjects, and number of teachers, pupils, and auxiliary staff is well illustrated in the survey referred to previously and also in a recent report of the Educational Research Council of Greater Cleveland.[54]

2. Why Team Teaching?

According to proponents, team teaching is a reasoned response to two persistent facts: (1) differences among teachers in preparation, skill, and experience, (2) the high proportion of teacher time devoted to noninstructional tasks.[55]
Team arrangements are intended to expose more pupils to superior teachers and to utilize all teachers more effectively by using paraprofessional and clerical assistance. The fundamental objective of team teaching is improved education at controlled cost. While these are the ultimate criteria, hard evidence about the advantages of teaching in these areas is not available. Experts, although enthusiastic about the trend, are unable to offer proof:

> *Measurement of pupil performance and adjustment has always been difficult and comparisons are not*

48
Maurice Hillson and Ramona Karlson (eds.), *Change and Innovation in Elementary School Organization* (New York: Holt, Rinehart and Winston, 1965), pp. 163-243.

49
Ibid., p. 164.

50
Stuart E.Dean and Clinette F.Witherspoon, "Team Teaching in the Elementary School," *Education Briefs* (No. 38; Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, 1962), p. 5.

51
National Education Association, *Team Teaching in Elementary Grades* (Educational Research Service Circular No. 9; Washington, D.C.: National Educational Association, 1965), p. 1.

52
National Education Association, *Schools for the Sixties, A Report of the Project on Instruction* (New York: Copyright 1963, McGraw-Hill Book Company, Inc.), p. 73. Used by permission of McGraw-Hill Book Company.

53
Educational Research Council of Greater Cleveland, *Team Teaching* (Cleveland. Ohio: Educational Research Council of Greater Cleveland, 1966).

54
Ibid., p. 67.

55
Bryce Perkins, "Team Teaching," *New Frontiers in Education*, ed. Fred Guggenheim and Corinne L.Guggenheim (New York: Grune, Stratton, Inc., 1966), p. 162.

> *easily made. In most of the studies reviewed by the author, there are apparently no startling differences in either achievement or adjustment of pupils in team teaching when compared to similar pupils in the self-contained or departmentalized setups. Unfortunately, there are certain aspects of achievement which are difficult to measure—such as creativity, independence, attitudes and appreciations.*[56]

Despite the absence of evidence, the trend to team teaching continues on the basis of professional judgment. It is argued that team teaching offers a multitude of advantages. Among those mentioned are career advancement within teaching for top teachers, more teacher preparation time, extended internship for beginning teachers, increased social support from peers for each teacher, continuous on-the-job in-service education as teachers learn from one another, shared evaluation of pupils, and greater facility in forming rational pupil groupings.[57]

These are some of the main benefits attributed to team teaching by its proponents. They appear to be reasonable expectations and are, no doubt, the major justification for this strong educational trend. But every trend has its skeptics and critics. The disadvantages attributed to team teaching are essentially as numerous and vital as the presumed advantages. It is claimed that team teaching minimizes teacher-pupil interaction, fosters formal presentations, increases costs, creates staff friction and discord, diverts time to intricate scheduling and planning, suppresses pupil participation, increases pupil insecurity (owing to frequent regrouping), multiplies distractions for the learner, increases pressures on teachers (especially introverts), and generally tends to make school organization more rigid.[58]

In defence of the team teaching concept, it should be said that many of these negative outcomes probably occur where team teaching is introduced without other simultaneous changes or without intensive staff re-orientation. Co-operative or team teaching can be a basis for total instructional re-organization, and it is compatible with many other educational trends: nongrading, integrating curricula, and use of advanced educational technology. The advantages apparently offered by team teaching seem most likely to be obtained where team teaching takes its place as one of a set of innovations out of which a more satisfactory learning environment is constructed.

Advances in Technology

Serious attempts are now being made to improve education by applying modern technology. This trend is an extension of the use of traditional teaching aids such as chalkboards, maps, and textbooks. Presently, every available device is being tried in the attempt to help more children to learn more and to learn more quickly and easily.

1. Response to Change

Reaction to this trend is varied. Some educators respond by emphasizing the importance of the human teacher in the educational process. They point out that no machine can provide the warmth and understanding required for human development. Advocates of full application of technology to education frequently agree that machines are impersonal. But they emphasize that machines can free the teacher from routine instruction and allow him to devote more time and energy to guiding, understanding, and motivating the individual child. Marshall McLuhan, however, claims that instruction as such is unnecessary in the electronic age. He says: "Schools are penitentiaries, interfering with the education of the students. . . . The instructional process has had it. There will be no instruction in our schools in a very few years. Five years, if you want an estimate."[59] Francis Keppel, a former Dean of the Harvard School of Education, accepts the potential of technology in education but has reservations about the current situation in the United States. He claims that technological devices are becoming available to the schools at a rate that exceeds software availability and at a rate that precludes an amount of teacher know-how that would make for effective use.

> *The next step is . . . the working out not only of particular innovations but of systems of change. Equipment must be linked with curricula, teaching methods to school organization, and all four to the preparation of teachers and to the measure of results in terms of what pupils learn.*[60]

This full-scale systems approach is proposed as a way of countering piecemeal adoption of educational technology.

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[56] *Ibid.*, p 201

[57] Hillson and Karlson, *op. cit*

[58] *Ibid*

[59] Harry J.Boyle, "Marshall McLuhan," *Weekend Magazine*, March 18, 1967, p. 2.

[60] Francis Keppel, *The Necessary Revolution in American Education* (New York: Harper & Row, 1966).

A parallel situation exists in Canada. According to the May, 1967 Bulletin of the Canadian Council for Research in Education,

> *. . . thousands of dollars worth of such equipment is presently stored in basements, or little used, and this includes items such as language laboratory equipment, paced readers, simple teaching machines, film and slide projectors, and television sets. These were purchased to solve problems which are still urgent,*[61]

The Bulletin item goes on to suggest major research expenditures to ensure that the dollars spent on technology will not be wasted.

2. Range and Effects of New Media

The range of new media or advanced technology includes practically everything not found in a conventional classroom 30 years ago. It includes presentation devices (such as the controlled reader), "canned" information (in the form of films and tapes), plus more elaborate innovations (such as the talking typewriter,[62] videotape recorder, and computer-assisted instruction) as well as the more familiar radio, TV, and overhead projector. All of these devices and forms of information are potential aids to teaching and learning. Many are difficult to incorporate into traditional patterns of teaching. Some are too expensive at present to be made available in every classroom.

The arrival of new media prompts teachers to examine past performances which were sometimes mechanical and often less than exciting. The potential and the problem of new technology in education is little understood. However, it is obviously a trend which cannot be ignored.

The new technology offers the immediate possibility of eliminating artificial boundaries between the school world and the "real" world. It is no longer justifiable to assemble students in classrooms, close the doors, and tell them about people, things, and events in the world outside the school. Technology has made it possible to bring experience and information from every realm of life directly to the student. He can see and hear a rocket launched, a dam built, a seed germinating; he can "be present" at the Battle of Hastings, D-Day, the founding of the UN, or an unfamiliar religious rite. The fully equipped school can become an open door to the world, rather than a cloister which shuts the world out. This possibility is a major justification for the use of technology in education.

3. Resulting Variability in Group Sizes

Two contrasting trends are evident in the application of technology in education: improved large-group instruction, and more individualized instruction. Oddly enough, these trends are interrelated. Overhead projectors, 16 mm. film, broadcast radio, and TV facilitate high-quality presentations to groups. Some of these devices (such as the overhead) contribute to improved presentations by a teacher. Others (such as TV, radio, and film) allow many children access to superior presentations by specially prepared teachers while regular teachers gain time for thought, preparation, or individual counselling. Often the same device (e.g., a tape recorder) can be used in several ways. Microfilm, 8 mm. single-concept loop films, tape recorders, and programmed materials allow teachers to individualize instruction. With these devices and materials, we move within reach of an important objective—the goal of having each child progress in his own direction and at his own rate.

Evidence is accumulating regarding the advantages of individualized instruction. For example, it has been found that boys using programmed materials can learn to read as well and as quickly as girls using the same materials.[63] But while fully individualized instruction is now a technical possibility, and while this may be educationally desirable, it does not appear to be immediately possible either economically or logistically because of the software gap.

4. The Potential of Computer-Assisted Instruction

Eventually, full utilization of technology seems most likely to take some form of computer-assisted instruction. CAI, as it is commonly called, is in a fairly early stage of development. It will not likely be available for mass implementation for ten or possibly twenty years. In the interval, however, experimental use of a host of technological aids can be expected. Questions rather than answers will be the rule. The questions will range in scope from the nature of the learning process to the optimal blends of media and devices for specific instructional purposes. Much attention will be given to the role of the teacher in this changing instructional mosaic.

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[61] *CCRE Bulletin,* No. 13, May, 1967, p. 1.

[62] "Talking Typewriter Patented," *Phi Delta Kappan,* XLVIII (January, 1967), 194.

[63] John D. McNeil, "Programmed Instruction versus Usual Classroom Procedures in Teaching Boys to Read," *American Educational Research Journal,* I (March, 1964), 113-19.

5. *The Educator's Decisions*

In the midst of the questions, the individual educator and administrator will make many decisions. They will decide to buy and not to buy, to buy this rather than that. It is to be hoped that they will demand evidence of the effectiveness of each device and each bit of material, and that they will make their purchases only for specific educational purposes.[64]

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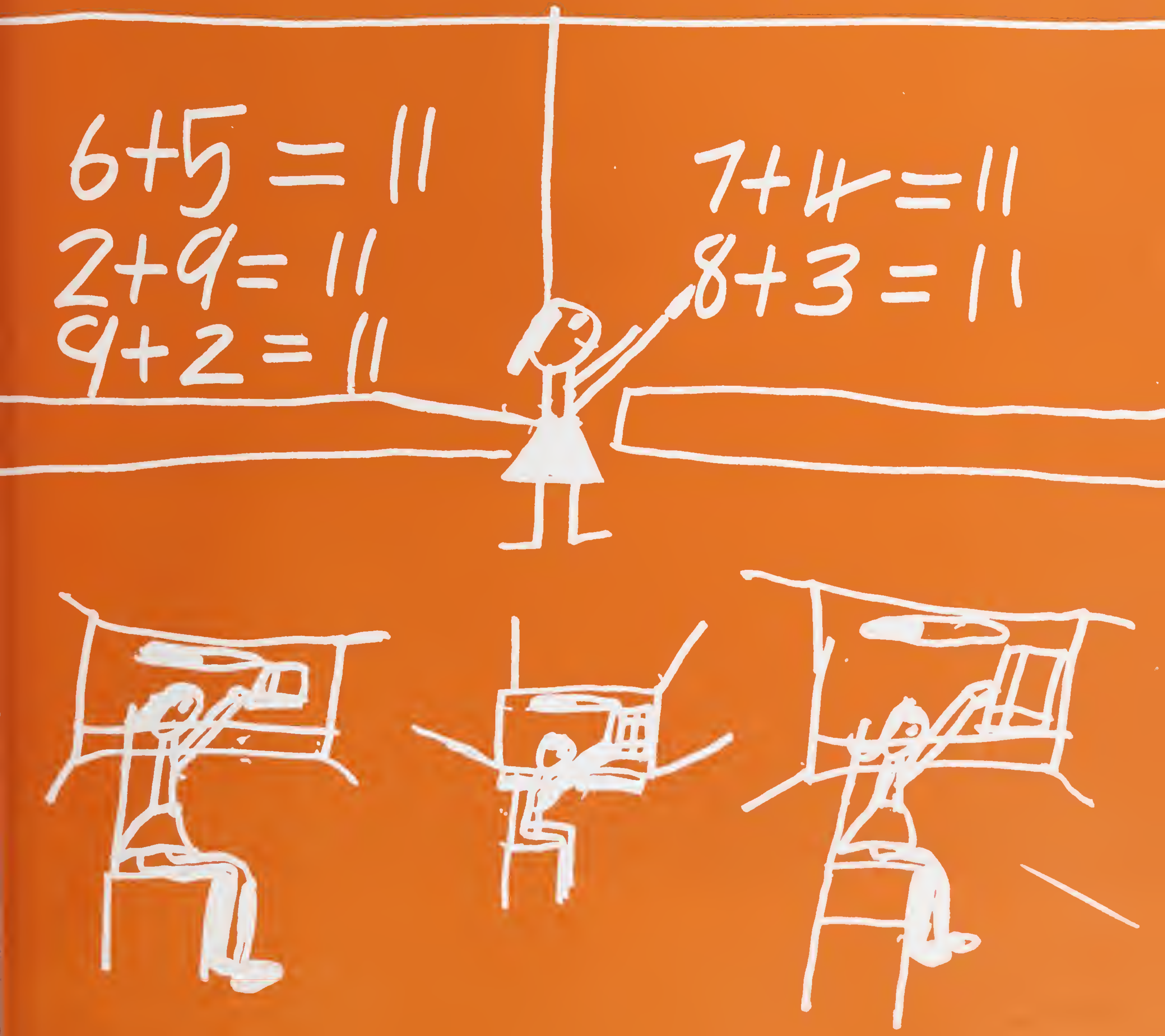
[64] Some excellent sources for the interested reader include the following books: John I. Goodlad, John F. O'Toole, Jr., *et al., Computers and Information Systems in Education* (New York: Harcourt, Brace & World, Inc., 1966); Ontario Curriculum Institute, *Technology in Learning* (2nd ed.; Toronto: Ontario Institute for Studies in Education, 1967); and National School Public Relations Association, *Technology in Education,* (An Education USA Special Report; Washington, D.C.: National School Association, 1967). A useful periodical, *Educational Technology,* is published by Educational News Service, P.O. Box 508, Saddle Brook, New Jersey. An interesting recent article is, Margaret Gayfer, "Education and the Future," *School Progress,* September, 1967, pp. 51-66

Part 2

Functional Elementary Schools for Metropolitan Toronto



The hard distinction between the individual and the society is now seriously questioned; involvement, participation, and inter-action are emphasized.

North Bridlewood Public School, Scarborough.

Photo by Alex Gray.

Chapter 6
Quality Education for an Era of Change

The user requirements we shall state for K-6 elementary schools in Metropolitan Toronto are based on our stated assumptions regarding the objectives and processes of elementary education. These are described in Chapters 1 to 4 of this Report. The user requirements are also based on our understanding of current trends in elementary education, as given in Chapter 5, and on our estimates of the extent to which these are likely to be implemented at the K-6 elementary school level in Metro.

These user requirements are our best estimates of the facilities required to house education today and in the near future. We are well aware of the risks of specificity in a rapidly changing world, but we realize that we must state school needs with some degree of concreteness if our work is to have any utility. In presenting these requirements, therefore, we must emphasize that they are not intended to be "the final word." They will remain usable only if they are subject to frequent, if not continuous, review and revision.

Premises of the Statement of Requirements

1. Scope of Current Social Change

One predominant characteristic of life today is its accelerating rate of change. We are rapidly moving away from prescriptive codes, traditional values, and fixed modes of conduct typical of the nineteenth and early twentieth centuries. We cannot look to the past for solutions to social, moral, technological, and political problems. The eighteenth and nineteenth century revolutions in industry and agriculture helped man conquer his physical environment. From a dependence on muscle and brawn, man moved into an era in which machines would do his heavier work. Today, we are entering an age of cybernation in which we will undoubtedly encounter social changes on levels that are even more profound.

A central paradox of the cybernetics revolution seems to lie in the fact that by means of the computer we are enabled both to treat other human beings collectively to an extent never before possible and, at the same time, to treat them individually to an unprecedented extent. The hard distinction between the individual and the society is now seriously questioned; involvement, participation, and interaction are emphasized instead.

There is evidence of rapid change also in the crumbling of many traditional attitudes, the rejection of political creeds based on slogans, and the gradual decline of our belief in authoritarian educational practices.

The implications of these changes for education, already noted, constitute a major premise of our statement of user requirements.

2. Reorientation of Public Education

In spite of rapid social change, the schools retain many ties with the past. Our public education system was born in the nineteenth century during the throes of the industrial revolution. Rote memorization, regimentation, and harsh discipline were some of the worst features of its early years. Although in recent decades more concern for the individual has appeared, we are still trapped by over-reliance on some traditional procedures. We lean too often, for example, on "telling," perhaps because it is our accustomed way of instructing a standard-sized group of pupils in a classroom of traditional size and shape. In fact, the accepted manner of describing a school today is by the number of classrooms it contains. Each classroom represents a cellular order of space (for the designer) and a unit of educational organization (for the teacher and pupils). Our schools, both in organization and design, are like egg crates. Too much emphasis is placed on collectivities, not enough on persons.

Society now requires a new type of person. Future educational emphasis will be not so much on the quantity of facts we know as on our ability to locate, judge, and use our facts. Those who are quick to learn new procedures, quick to understand changing processes, and prepared to learn on a continuous basis throughout their lives are the ones who will have most to offer an employer. The individual most in demand will be the one with a keen and flexible mind. Also, as automation and technological innovation reduce the length of man's traditional work day or work week, the wise and creative use of leisure time by large segments of our population will become increasingly important. In the near future, man's greatest reward may no longer be economic but rather psychological—the pleasure derived from his involvement in creative work and from his encounter with new problems. In education, the stress will be on the processes of thinking, learning, and creativity.

3. Relationship between Theory and Practice

One of the basic premises of SEF is that the school system should reflect, as soon and as fully as possible, the implications of relevant, valid, reliable research. In order to achieve this state of affairs, many conditions must, of course, be met. To date, one of the reasons for the gap between theory and practice has been the high cost of remodelling physical facilities to accommodate innovative practices. We believe that *facilities* recommended as user requirements should literally *facilitate* the implementation of educational innovations.

Research evidence and rationales for the most significant educational trends (innovations) were presented in Part 1 of this Report. The following brief review of Part 1 is intended to emphasize the relevance of theory and research to the planning of facilities and the extent to which the process of synthesizing from the literature (Part 1) has had an influence on our committee deliberations and contributed directly to the formulation of user requirements.

In the realm of objectives for elementary school education, indeed for all levels of public education, we have suggested a three-fold classification. Speaking very generally, we believe that public education should provide for the individual needs of each child, should accommodate societal demands, and should disseminate knowledge and promote its development. Within this framework, we believe that it is the task of school boards and professional educators to formulate educational goals on many levels. It is our view that clarity in goal-setting is of vital importance in the educative process—particularly in a time of rapid social and technological change.

In the chapter on the learning process, we have stressed that learning is a personal process, and that our schools, therefore, should provide greatly increased opportunities for individual learning. Because learning is also accumulative, we should develop organizational arrangements which assure the continuous progress of each individual child in a nongraded setting. Because learning is a unified process, we shall need a vertically and horizontally integrated curriculum. Furthermore, because learning is a natural and purposeful process dependent upon interaction between the child and his environment, teachers must be given every opportunity to encourage such interaction.

Certain curriculum trends are evident today. School curricula are increasingly focusing attention on the processes of learning and the structure of subjects, rather than on content as such. Some curriculum builders are also concerned with integration across traditional subject lines. Further, it is now well accepted that the curriculum should be so organized that the needs of each individual child are provided for in a continuous fashion. Finally, there is increasing emphasis today on providing optimal conditions for the development of creativity.

Developments in technology and increased freedom in organizational arrangements are contributing to the evolution of the teacher's role. The trend is away from routine instruction of classes of conventional size and toward guiding and tutoring individuals and small groups. Modification of teacher preparation and in-service programs is necessary to ensure that teachers have the competence and adaptability to meet these challenges.

The teacher is, at present, the crucial link in the chain of innovation. Unless teachers understand and implement new practices, there is little chance that these practices will be effective in promoting the objectives of the school. The potential benefits of continuous progress plans, of co-operative teaching, and of many developments in the field of educational technology must otherwise be lost.

4. Relationship between Educational Function and Design Form

Another premise of our Study is connected with the relation between educational function and design form. The educational processes to be housed in the schools of tomorrow may be likened to the endless dividing, joining, and re-grouping of living micro-organisms, where the underlying order is that of organic life, rather than the simpler mathematical order of the crystal. The school of the past suited its role of housing educational groups which were organized on a simple, geometrical plan. Hence, it was divided into static subdivisions. The school of the future must, like the processes it houses, permit mutation and re-grouping of its interior and exterior spaces in response to a continuous process of change. Over a decade of operation, a school may be required to undergo many changes in interior layout in order to accommodate changing educational requirements.

If we are to be rational, we must accept the concept of change. Permanence in educational methodology is unlikely, and the design of the buildings housing education must therefore permit easy and economical interior space changes. The prime prerequisites of future school design may be summarized as follows:

(a) sufficient space for organic educational processes to achieve optimal performance,
(b) appropriate spatial and environmental flexibility to make possible optimal learning performance,
(c) an aesthetic and psychological environment based on the nature and learning needs of the individual child,

(d) provision of the above prerequisites within the developing economic framework of society.

5. Relationship between Function and Cost

SEF was not established to develop "pie-in-the-sky" prescriptions for school facilities. On the contrary, it is charged not only with the task of specifying what facilities are now required for quality education but also with the responsibility of recommending an economical method for obtaining these facilities.

Our problem, initially, was to decide which of the two criteria—requirements or cost—should be treated as primary. Our solution was to take requirements as our starting point but to consider costs as a major parameter. Where our stated requirements cannot be immediately attained because of the cost factor, we propose them as obtainable and realistic goals—realistic in view of the expanding economy of Metro, and because the educational utility of the school over the full life of the building must be considered in conjunction with its initial cost.

General User Requirements for K-6 Elementary Schools in Metropolitan Toronto

The remainder of this Chapter will be devoted to a summary of the user requirements which will be elaborated in Chapters 8 through 15. It is appropriate to begin this summary with some comments on size, location, and site requirements for K-6 schools.

1. Desirable Size (Enrolment)

Professional opinion in our elementary school committees was virtually unanimous in recommending that elementary (K-6) schools should be community oriented and that they should accommodate enrolments of about 550 to 825 pupils.

It was felt that enrolments well below about 550 pupils (of 300 to 400 pupils) might not adequately support educational practices such as nongrading and co-operative teaching which are designed to individualize learning opportunities. Furthermore, the construction of very small elementary schools raises the overall cost of school construction in a community. Like a larger school, the smaller school requires the basic administrative, ancillary, and service facilities, with the result that on a per-pupil basis the smaller school is more costly. Also, the Metropolitan Toronto Ceiling Cost Formula (which will be described in Chapter 7) operates less generously in ancillary and service area allotments for smaller schools. A larger enrolment, approaching 825 pupils, appears desirable.

It is true that the prospect of enrolments at or near 825 pupils seemed to worry some of the principals on our committees. They were understandably concerned about the risk of losing contact with pupils, parents, and the work of teachers. These principals recognized, however, that the possibility of such losses would be decreased if they themselves were free to devote more time to the introduction, administration, and measurement of innovative practices. This freedom, they believe, will come gradually as a result of increased assistance from vice-principals and guidance counsellors.

An elementary (K-6) school ultimately accommodating up to approximately 825 pupils appears to offer potential educational advantages, considerable economies on a per-pupil cost basis, and larger and more varied ancillary and service space allotments.

2. Location[1]

The ages of elementary school children dictate that a K-6 elementary school should be closely identified with its community. It should be located in a quiet zone within a one-mile radius of the homes of its children. Even this radius will vary depending on the nature of the housing and density of the population. The school must also be so located, in relation to other existing and planned elementary and senior schools, that it will serve the overall educational objectives of the borough.

A location free from dust, noise, fumes, and airport traffic patterns, and away from busy industrial or business districts, is to be preferred. The location should also be such that children will not have to cross busy traffic arteries to reach the school. Finally, the school site should offer easy access by foot, car, and bus.

3. Site

The selection of many school sites in Metropolitan Toronto, especially in the older areas, has been characterized by compromise between what school officials would like to have had and what practical circumstances have dictated. In Chapters 11 and 14, we intend to present more fully our views and recommendations concerning outdoor education and the need for greatly improved utilization of grounds.

At this point, however, we urge consideration of the principle that a school site should fulfil not only the educational needs of its pupils but also a number of the recreational needs of the people living in the area served by the school. There are some excellent examples, within Metropolitan Toronto, of enlarged school sites which have been jointly financed by school boards and civic authorities. In such cases the site serves both school and community needs.

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[1] Ontario Department of Education, *Suggestions for the Layout and Construction of Schools in Ontario* (Toronto: Ontario Department of Education, 1962).

The trend towards larger, better developed, and more widely used elementary (K-6) school sites has been frustrated in Metro by a number of factors. Many existing sites in built-up areas are too small; the cost of enlarging these at prevailing land prices is extremely high. Further out, in expanding suburban subdivisions, rapidly increasing land values have caused a marked increase in the purchase price of new sites of desirable size. Population shifts, both in the city's inner core and in suburban areas have created pupil population booms which have rendered formerly adequate school facilities unsatisfactory. When school buildings are enlarged, or where portable classrooms are added to accommodate increased enrolments, the size of the school playground is decreased somewhat in actual size, and quite dramatically on a per-pupil basis. In addition, an expanding transportation system has brought noise and traffic hazards to many previously satisfactory sites. Although there are excellent examples of co-operative planning and cost-sharing concerning sites by civic authorities and school boards, a lack of co-ordinated long-range planning among different levels and departments of civic government has generally presented obstacles.

School sites should be planned for future as well as present needs. Officials responsible for site selection should acquire knowledge of present and projected community development, so that their school site selection and development will be part of a co-ordinated community plan. Where possible, school sites should be selected in co-operation with civic parks officials in order that they may be located adjacent to parkland and wooded ravines. An ample school site, with sufficient provision for further growth, should be selected and allocated before community development or redevelopment is permitted.

The size of the school site is only partially related to the size of the school plant and the required area for such services as parking, deliveries, and safe bus-loading zones. The site must also "offer the maximum service for the educational program concerned."[2] Site size is related, as well, to future building expansion and to net usable playground space per child. Full community use of the site during after-school hours for such activities as tennis, baseball, volleyball, basketball, swimming, track and field, football, and soccer are also important considerations. A useful "rule of thumb," allowing fulfilment of these educational and community objectives, would be to provide elementary (K-6) school sites of up to 550 square feet per child enrolled at the proposed ultimate size of the school. For an elementary (K-6) school expected to grow to about 825 pupils, this would mean that a site of up to ten acres would be desirable.

School Plant User Requirements

In Part 3 of our Report, we propose to describe fully the specific areas needed to fulfil the educational objectives and functions of an elementary (K-6) school. At this point, we shall simply list these required areas, describing each one briefly. The required areas are as follows:

(1) General learning areas (instead of enclosed classrooms),
(2) Kindergarten (and junior kindergarten where approved),
(3) Music room
(4) General purpose area (gymnasium),
(5) Library materials centre,
(6) Counselling centre,
(7) Auxiliary areas (administrative, health centre, staff lounge, and school grounds),
(8) Service areas.

1. General Learning Areas

Instead of an enclosed-classroom design with each classroom 875 or 900 square feet in size, we advocate the clustering of two to eight or more classrooms in an open area with a flexible interior partitioning system. The school's interior would be composed, in the main, of a series of open spaces. Because of longer structural spans and completely flexible partitioning, lighting, mechanical, casework, and furniture arrangement systems, many different sizes and shapes of teaching and learning stations could be provided within each zone. Some of the space traditionally used for corridors might be incorporated in these open clusters.

Each of these open cluster or general learning areas could contain various sizes of teaching stations, learning or project centres, and seminar areas, plus a teacher preparation area, pupil washrooms, and outdoor clothing casework facilities. Educational objectives connected with individual learning, continuous progress, and co-operative teaching could be more easily attained in these flexible surroundings than in traditional classrooms.

Each general learning area would bind pupils and teachers closely together in a "school-within-a-school" arrangement. Each would contain a "common participation area" or "group participation common" in its centre.

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[2] *Ibid.*, p. 11.

The essential component sections of these proposed general learning areas are as follows:

(a) teaching stations of approximately 750 square feet each, divided from other parts of the general learning area by a flexible partition or casework system,
(b) a common, or central participation, area of about 250 square feet per teaching station, serving the learning and teaching functions of the general learning area.[3]
(c) a small enclosed project or seminar room of approximately 150 square feet, which would be acoustically isolated yet visually connected with the rest of the area,
(d) a teacher workroom and academic storage room, with an area allotment of approximately 75 square feet per person, which ideally might be located adjacent to the seminar room suggested in (3) above, and which should contain working space for every regular teacher in the general learning area plus one extra (intern teacher's) working space for every four regular teachers,
(e) other facilities, such as pupil washrooms, storage for outdoor clothing, and mechanical service facilities. (Circulation patterns within the general learning area and in relation to the rest of the school and its environs must also be considered in developing such a design.)

2. Kindergarten and Junior Kindergarten

Following current practice, we recommend that a junior kindergarten containing 20 pupils be assigned 1,000 square feet, and a senior kindergarten containing 30 pupils, 1,200 square feet, including the required washroom, outdoor clothing, and storage facilities. When more than one kindergarten is required, the rooms might be adjacent, and by means of a flexible partition system, share some common facilities or central participation space, thus reducing the overall area requirements of a kindergarten complex.

3. Music Room

Because of considerations advanced in Chapter 10, we favor a more intensive music program, with the introduction of instrumental music at the elementary (K-6) school level. For obvious reasons, open general learning areas cannot be used for a music program. The Study recommends a separate music room of 1,200 square feet.

4. General Purpose Area

With the assignment of music to a suitably enclosed music room, the general purpose area could be used principally as a gymnasium. Like the music room, the general purpose area should be enclosed and located away from quieter areas of the school.
The general purpose room floor area recommended by the Department of Education is 2,500 square feet for the size of school described here. We believe 2,000 square feet of floor area would suffice. However, space in excess of either allotment is required for athletic equipment storage, dressing rooms, kitchen, and stage and chair storage.
A second gymnasium of 2,000 square feet adjacent to the first is likely to be required when pupil enrolment reaches the equivalent of 16 traditional classrooms. It is certain to be needed at a 20-classroom enrolment size.

We recommend a portable or removable stage arrangement.

5. Library Materials Centre

For the educational reasons advanced in Chapter 12, we believe that greatly enlarged and improved library materials centres are required in our elementary (K-6) schools. At the present time, a centre consisting of a reading and resource section, enclosed project areas, and a teacher office and workroom area are basic requirements. We recommend an area of 4,000 square feet for the immediate present, with provision for gradual increases in future.

6. Counselling Centre

It now seems well accepted that cases of learning disability and social maladjustment should be identified and remedied in the early school years. Yet, traditionally, very little area has been provided in elementary (K-6) schools for the important work of counselling. We believe that the K-6 school requires a guidance and counselling space of at least 400 square feet. We suggest this figure as a present area allotment which should be increased as counselling services expand.

7. Auxiliary Areas

(a) Administration
An allotment of 900 square feet should provide

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[3] The size of this central common would vary with the size of the whole cluster, but, as a "rule of thumb," 250 square feet per teaching station should be allotted to this central common area. For instance, if the general learning area were to contain six teaching stations (i.e., 195 pupils and six teachers), the central common should be allotted 1,500 square feet for the learning, teaching, and acoustical reasons advanced in Chapter 8.

adequately for the functions of an elementary (K-6) school office. In addition, we recommend a small conference room of 150 square feet located, preferably, in such a way as to serve both administration and guidance purposes. A central administration and school supply storage area of about 375 square feet is also required.

(b) Health centre
Such a centre in an elementary (K-6) school requires an area of 450 square feet.

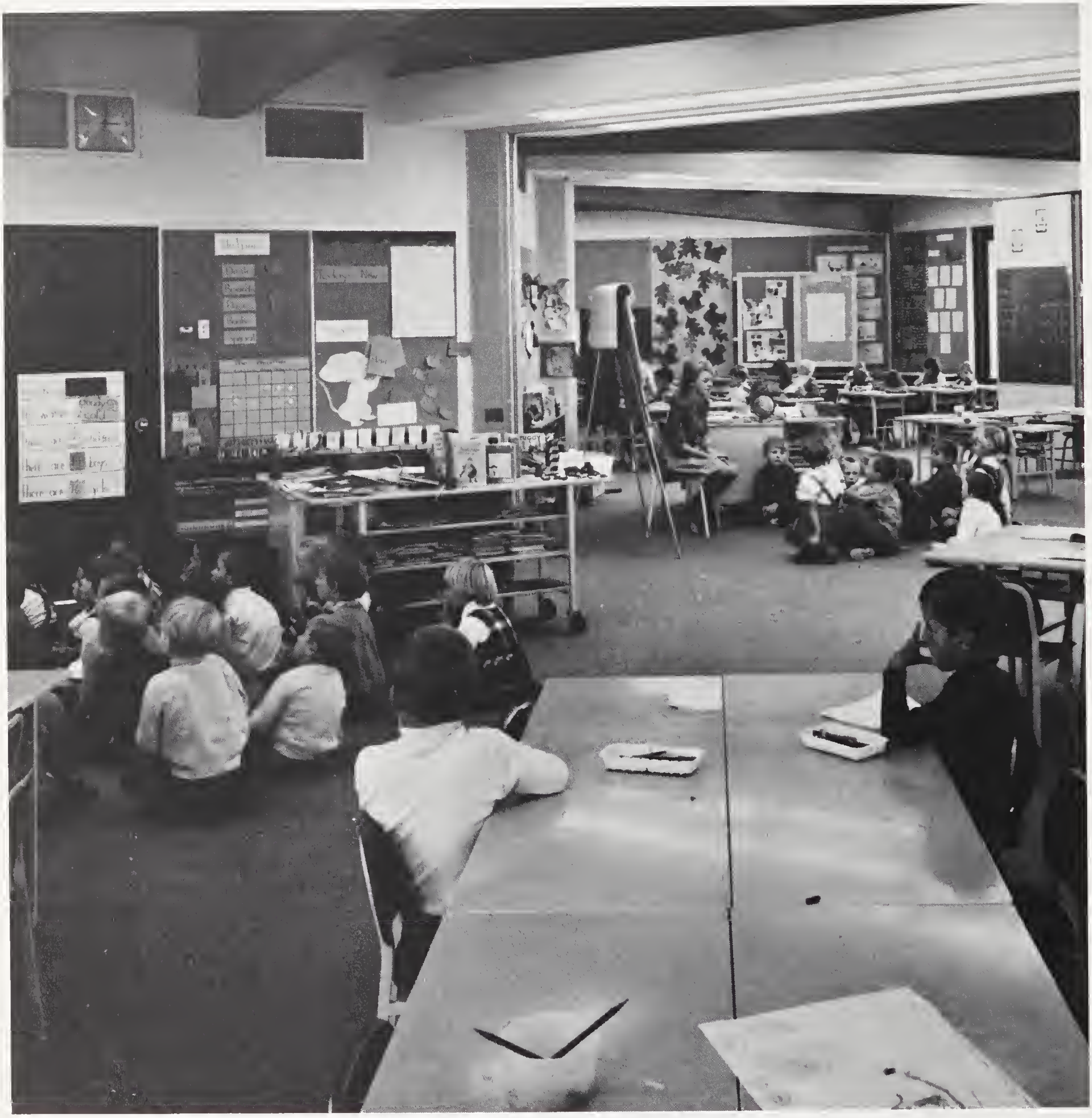
(c) Staff lounge
For a school growing from approximately 500 to 825 pupils, a common staff lounge, including kitchenette and outdoor clothing facilities, requires an area of approximately 850 square feet. Men's and women's washrooms, adjacent to but not entered from the lounge, will require approximately 200 square feet.

(d) School grounds
Some general remarks about grounds were made earlier in this Chapter. Detailed recommendations are contained in Chapter 14.

8. Service Areas

The Metropolitan Toronto Ceiling Cost Formula allots, for service purposes, an area equivalent to six square feet per pupil. Our recommendations concerning the use of this space allotment are to be found in Chapter 15.

An area, rather than a classroom, formula means that allowance for instructional space is based on a number of square feet per pupil, and not on a specific number of classrooms. This will allow greater design freedom in planning variable kinds and sizes of learning areas.



William G. Davis Public School, Pickering Township. W.Saccoccio, Architect. Photo by Hans Geerling.

Chapter 7
The Functional School and the Ceiling Cost Formula

Throughout our Study we have considered our requirements in the light of the Ceiling Cost Formula for School Construction in Metropolitan Toronto. At this point, a brief summary of this Formula may help the reader understand some of the complexities of school construction in Metro Toronto.[1]

The annual budget for school construction in its entirety as prepared by the Metropolitan School Board must be approved by the Metropolitan Toronto Council. Following the creation of the Municipality of Metropolitan Toronto by the Provincial Legislature's Bill 80 in 1953, it soon became apparent that an inordinate amount of time would be spent by the Metropolitan Council in reviewing each individual school project, and that the efforts of the Council in so doing would be a duplication of work at the Metropolitan School Board. Consequently, in 1954, an agreement was reached between the Metropolitan Toronto Council and the Metropolitan School Board that, within the annually approved budget for school construction, the capital funds required for individual school projects would be approved by the Council, provided such costs were within a ceiling cost formula.

In each year following 1954, either as part of the capital budget negotiations or in advance of these negotiations, the Ceiling Cost Formula for the year was agreed upon by the Metropolitan Toronto Council and the Metropolitan School Board. The Formula provided a ceiling for the maximum area of a school and the size of its component parts, and a fixed sum of money per pupil space for elementary, middle, and secondary schools. Over the years, the Ceiling Cost Formula was adjusted to meet changes in approved facilities and rising costs. In providing a basic standard for the debenturing of funds for school construction in Metropolitan Toronto, it operated remarkably well.

Certain difficulties during recent years indicated, however, that the form of the original Formula needed revision. During the year 1966, in particular, there was wide variation in the unit cost (contract cost per square foot) of school construction throughout Metropolitan Toronto. It was apparent that a formula based on a fixed unit cost was becoming less and less workable. Also, its application had become increasingly complex, as provision had to be made for such matters as borrowing against future additions and adding facilities other than classrooms. There was also a need for some means of distinguishing effectively between new buildings and additions, between small and large buildings, between the initial phases of a building and subsequent additions, between city core and suburban schools and sites, and between the substantial costs of developing a new school site and the relatively minor costs related to site changes accompanying an addition. Furthermore, certain trends in education constituted an indication that future schools would be based less on standard classrooms and more on a wide variety of instructional and learning areas with varying maximum capacities.

The Revised Ceiling Cost Formula, 1967[2]

Effective January 1, 1967, the Provincial Legislature, by Bill 81,[3] completely revised the political, administrative, and financial structure of Metropolitan Toronto. Its original eleven municipalities were reduced to six. These were to include five enlarged boroughs (Etobicoke, York, North York, East York, and Scarborough) and the City of Toronto. Similarly, the responsibilities of the Metropolitan Toronto School Board (its official name was changed by the Act) were greatly extended, giving the Board virtual financial control of education in the Metropolitan area. Only minimal discretionary financial powers were left in the hands of the six local boards of education.

To meet the new situation, a completely revised Formula was developed to take effect January 1, 1967. As was the case with its predecessor, the revised Ceiling Cost Formula represents an agreement for the current year between the Metropolitan Council and the Metropolitan Toronto School Board, and it provides the basic standard for school construction debenturing in Metropolitan Toronto.

The 1967 document, however, is a much more flexible instrument. Revision can be made without destroying its basic structure. It is *primarily an area formula*[4] operating within certain cost parameters.

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[1] The information in this section has been drawn very largely from *The Metropolitan Toronto School Board Ceiling Cost Formula for School Construction for the Year 1967* (Toronto The Metropolitan Toronto School Board, 1967), pp. 3-4. Cited hereafter as Metro Ceiling Cost Formula, 1967.

[2] *Ibid.*, pp. 4-7.

[3] *An Act to Amend the Municipality of Metropolitan Toronto Act,* Bill 81, 4th Session, 27th Legislature, Ontario, 14-15 Elizabeth II, 1966, pp 13-30

[4] "The sum of the areas thus approved will constitute THE TOTAL APPROVED AREA." See Metro Ceiling Cost Formula, 1967, p 4

The application of the Formula is described below in a table which demonstrates the approved method of calculating (1) total (net) approved area, and (2) total approved cost, of an elementary (K-6) school.

Table 1
The Ceiling Cost Formula, 1967, for Elementary Schools, Grades K-6

Approved Area

Instructional (pupil capacity of proposed building x 37.5 sq. ft.)
Ancillary and Administrative (pupil capacity at approved ultimate size x 19 sq. ft.)
Service (pupil capacity at approved ultimate size x 6 sq. ft.)

Total (Net) Approved Area (including corridors but excluding walls)

Approved Cost

Contract Cost (above total approved area x basic cost $22.25 per sq. ft.)
Architects' Fees (in accordance with Ontario Association of Architects' schedule of fees)
Equipment (pupil capacity of proposed building x $106)
Site (as approved)
Contingencies (3% of contract cost)

Total Approved Cost

It is appropriate here to describe in more detail how each of the above area and cost items is applied in the 1967 Ceiling Cost Formula. To illustrate the Formula, we have assumed that an elementary (K-6) school will open in one of the boroughs in September, 1968, with an estimated enrolment of about 550 pupils. Population projections in this borough have indicated that the ultimate pupil enrolment will reach about 828 pupils in September, 1973.

1. Approved Areas

a. Instructional areas
Since the pupil capacity of the proposed school at its opening in September, 1968, will be 550 pupils, we apply the Formula by multiplying this number by 37.5 square feet. This means that the allowance for instructional space is based on a number of square feet per pupil, and not on a specific number of classrooms, as in the previous formula. This will allow greater design freedom in planning variable kinds and sizes of learning areas.

b. Ancillary and administrative areas
The Formula firmly stipulates that in no case may the allowances made for ancillary and administrative areas be less than the facilities required for a 450-pupil school. In calculating the amount of these areas, the Formula permits the borough boards at their discretion to calculate these areas at the ultimate size of the school (i.e., ultimate enrolment size), which in our example is 828 pupils. These areas could be calculated (with some minor and detailed reductions) at 828 pupils x 19 square feet. Furthermore, to accommodate emerging instructional trends which require more varied and flexible space, a borough board may request the Metropolitan Toronto School Board to allow some flexibility of interpretation in permitting some interchange of spaces between instructional and ancillary areas. This might result in some instructional areas being defined as ancillary areas (or vice versa), and in some cases might permit a borough board to incorporate needed facilities in the opening year of the school rather than later.

c. Service areas
Similarly, the space allotted to service areas may not be less than the facilities required for a 450-pupil school. Like ancillary areas, service areas may be calculated in relation to the number of pupils attending the school at its ultimate size. (In this case, it would be based on an enrolment of 828 pupils.) The amount of space allotted for this purpose (six square feet per pupil) may *not* be used for any instructional or ancillary purpose or for purposes of educational administration.

2. Approved Cost

a. Contract cost
This is a stated base cost (a contract cost per square foot). It is based on the building cost

experience of the previous year and is used for budget purposes. School construction tenders which are found to have total costs within the Ceiling Cost Formula can be approved without delay. Where total cost based upon tender price exceeds total approved cost, a project will be reviewed by technical personnel at the Metropolitan Toronto School Board. On the recommendation of such technical personnel, the ceiling cost may be adjusted to each individual project and the actual unit cost of the tender, *provided* that the technical personnel shall remove from the cost any amounts required for facilities declared to be above an adequate standard for Metropolitan Toronto Schools.[5] For the year 1967, the contract cost of a K-6 elementary school has been established at $22.25 per square foot of net area (excluding walls).

b. Equipment costs
Under the previous formula, a bulk sum of money for equipment items was permitted for each new school. This sum, developed in relation to the prices and practices of 1953, had proved inadequate in recent years. In the 1967 Formula, a single per-pupil allowance for equipment of $106 is provided for a K-6 elementary school. This represents a noteworthy increase over past equipment allowances and compares very favorably with expenditures for this purpose in many other systems. However, any thoroughgoing program of individualization which depends to a major extent upon computer-assisted instructional technology will call for much larger per-pupil equipment budgets.

By definition, an equipment item is one *not* included in the general contract. Moreover, it is one that is listed on the permanent inventory record of the school and, in general, is one that has a per-unit cost of at least $25. The exception is furniture. *All* items of furniture—even those with a per-unit cost of less than $25—are defined as equipment. The equipment allowance is not intended to cover purchase of "supply" items.

c. Site development costs
The previous formula, as we have seen, made no provision for varying site conditions and requirements throughout the Metropolitan area. The 1967 Formula, while it lists those site development costs which are "normally" included in the building contract,[6] makes allowance for situations in which site development beyond this limit is needed. In such cases the Formula permits extra site development costs to be determined separately from the approved cost of the school on the proper submission of the need for such costs by the borough board. Such site applications are reviewed by the technical personnel of the Metropolitan Toronto School Board, and a recommendation is made as to the portion of the proposed costs to be approved for financing by debenture.[7] Eventually, it is hoped to develop specific site standards.

3. Adjustments of Ceiling Cost

The 1967 Formula also includes provision for certain upward adjustments in cost. If the actual cost of a new school based upon the lowest acceptable tender should exceed the total approved cost under the Formula, perhaps because of special circumstances at the time of tendering, such plans and specifications will be reviewed by technical personnel at the Metropolitan Board. The approved costs may be adjusted upward with respect to all tenders submitted, *provided* there is removed from the costs financing required for facilities declared to be above an adequate standard for Metropolitan Toronto schools.[8]

4. Rehabilitation of Schools

The new Ceiling Cost Formula likewise defines the processes to be followed in those cases where older schools need rehabilitation. Readers who are interested in this may obtain the necessary information by referring to the Formula.[9]

Simulation of SEF User Requirements for an Elementary (K-6) School into the Metropolitan Toronto School Board's Ceiling Cost Formula, 1967

Because the Ceiling Cost Formula is primarily an area (square feet) formula, this simulation will deal mainly with area. The purpose of this exercise is to show in detail how the SEF user *area* requirements relate to the maximum area allotments attainable under the current Ceiling Cost Formula. Some implications of this comparison are then set forth.

1. Assumptions Concerning Enrolment and Borough Board Policy

It is assumed for the purposes of this simulation that the elementary school will open in September, 1968, with an enrolment of 550 pupils, and that the enrolment will increase to 828 pupils by September, 1973. Increase beyond this size is not anticipated.

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[5] The term "adequate standard for Metropolitan Toronto Schools" is now in process of being specifically defined Immediately following the coming into effect of Bill 81, new technical personnel were hired to perform this task.

[6] Metro Ceiling Cost Formula, 1967, Appendix A, p. 12

[7] *Ibid.*, p. 6.

[8] See footnote 5

[9] Metro Ceiling Cost Formula, 1967, pp. 16-17.

The composition of the school by grade level is presented in Table 2 for the opening date and in Table 3 for the ultimate enrolments. The results of calculations[10] of Formula allowance are also shown.

In calculating the area allotments in Tables 4 and 5, it has been assumed that the borough board would apply for ancillary and service area allotments based on ultimate enrolment (828 pupils).

Table 2
Pupil Spaces Allowed Under 1967 Ceiling Cost Formula for a Standard School at Opening, September, 1968

Grade	Actual Enrolment	Number of Classrooms	Formula Allowance
Junior kindergarten	37	1	18.5
Kindergarten	56	1	28
1	93	3	93
2	64	2	64
3	96	3	96
4	63	2	63
5	65	2	65
6	62	2	62
Opportunity class	14 (Rating 16)	1	32.5
Total	550	17	522[a]

Table 3
Pupil Spaces Allowed Under 1967 Ceiling Cost Formula for a Standard School at Ultimate Size, September, 1973

Grade	Actual Enrolment	Number of Classrooms	Formula Allowance
Junior kindergarten	37	1	18.5
Kindergarten	90	2	45
1	96	3	96
2	94	3	94
3	130	4	130
4	126	4	126
5	123	4	123
6	118	4	118
Opportunity class	14 (Rating 16)	1	32.5
Total	828	26	783[a]

[a] In this case, actual enrolment means projected enrolment by demographic survey The disparity between the actual enrolment and the formula allowance total figures may be explained as follows

1 The formula allowance figure is based on the actual enrolment figure in all regular grade classrooms for the total school day However, in the case of junior kindergartens or kindergartens where the pupils attend for only one half of each regular school day, the actual enrolment figure is halved to arrive at the formula allowance figure. Thus, the formula allowance figure represents the actual number of kindergarten pupils occupying the area(s) at any one time.

2 In the case of a junior or intermediate opportunity class, the current ruling is to allow the area of at least a normal size classroom for 16 pupils. Hence, the formula allowance for this area is based on a full class allotment number of 32.5 pupils, regardless of the actual enrolment.

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[10] Metropolitan Toronto School Board, Regulations Applicable to the 1967 Ceiling Cost Formula for School Construction Calculation of Approved Ceiling Cost for a New Junior Public School, April 18, 1967. (Mimeographed.)

Table 4
Area Allotments Available Under the 1967 Ceiling Cost Formula: Approved Area at Opening, September, 1968

Instructional Area (522 pupils x 37.5 sq. ft.)	19,575 square feet
Ancillary Area (783 pupils–16.5 [Opportunity Class][a] x 19 sq. ft.)	14,564 square feet
Service Area (783 pupils–16.5 [Opportunity Class] x 6 sq. ft.)	4,600 square feet
Total Net Area (exclusive of walls)	38,739 square feet

[a] For instructional purposes, the formula allows the full allotment of 32.5 pupils at 37.5 square feet per pupil in opportunity or other disability classes. However, for ancillary (19 square feet) and for service (6 square feet) area allotments, the formula allows only the rated number of pupils for each type of disability class. In this case, for a junior opportunity class the rating is 16 pupils (32.5–16.5).

Table 5
Area Allotments Available Under the 1967 Ceiling Cost Formula: Approved Area at Ultimate Size, September, 1973

Instructional Area (783 pupils x 37.5 sq. ft.)	29,350 square feet
Ancillary Area (783 pupils–16.5 [Opportunity Class] x 19 sq. ft.)	14,564 square feet
Service Area (783 pupils–16.5 [Opportunity Class] x 6 sq. ft.)	4,600 square feet
Total Net Area (exclusive of walls)	48,514 square feet

Simulation of the SEF Functional User Requirements

In this section, we propose to illustrate fully the areas required to accommodate SEF recommendations. The enrolment projections are identical to those used previously, namely,

At opening, September, 1968	550 pupils
At ultimate size, September, 1973	828 pupils.

Table 6
Simulation of SEF Functional User Requirements: Area at Opening, September, 1968

Instructional Area Requirements	Square Feet
1 Junior kindergarten	1,000
1 Kindergarten (senior)	1,200
3 General learning areas:[a]	
14 teaching stations @ 750 sq. ft.	10,500
1 opportunity class @ 750 sq. ft.	750
common areas—15 @ 250 sq. ft.	3,750
3 seminar rooms @ 150 sq. ft.	450
2 teacher workrooms (for 18 teachers and interns including academic storage @ 75 sq. ft. per person)	1,350
Circulation allowance for instructional area[b]	3,363
Sub-total, Net Instructional Area	22,363
Ancillary Area Requirements	
1 General purpose room	2,500
athletic and community storage	450
dressing rooms–2 at 200 sq. ft.	400
kitchen	75
stage and chair storage	200
1 Library materials centre (including all sections, workrooms, project rooms, etc.)	4,000
1 Music room	1,200
1 School administration centre	900
1 Conference room[c]	150
1 Guidance centre	400
1 Health centre	450
1 Staff lounge (including kitchen, clothing storage)	850
Academic storage area(s)–central school storage	375
Pupil washrooms	1,000
Staff washrooms	200
Circulation allowance for ancillary areas	4,157
Sub-total, Net Ancillary Area	17,307
Service Area Requirements	
(783 pupils–16.5 Opportunity Class)[d] x 6 sq. ft.	4,600
Net Area at Opening, September, 1968	44,270

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[a] It is important to refer to pp. 62-63.

[b] In calculating this instructional area, the common area, seminar rooms, and teacher workrooms were not included. A 25 per cent circulation factor for all other instructional areas has been permitted.

[c] Refer to pp. 63-64.

[d] See footnote a, Table 4 (p. 71).

Table 7
Simulation of SEF Functional User Requirements: Area at Ultimate Size, September, 1973

Instructional Area Requirements	Square Feet
1 Junior kindergarten	1,000
2 Senior kindergartens @ 1,200 sq. ft.	2,400
4 General learning areas[a]	
22 teaching stations @ 750 sq. ft.	16,500
1 opportunity class @ 750 sq. ft.	750
common areas—23 @ 250 sq. ft.	5,750
4 seminar rooms @ 150 sq. ft.	600
4 teacher workrooms (for 28 teachers and interns including academic storage @ 75 sq. ft. per person)	2,100
Circulation allowance for instructional area[b]	5,163
Sub-total, Net Instructional Area	34,263

Ancillary Area Requirements	
1 General purpose room	2,500
1 Gymnasium	2,000
athletic and community storage	650
dressing rooms—2 @ 400 sq. ft.	800
kitchen	75
stage and chair storage	200
1 Library materials centre (including all sections, workrooms, project rooms, etc.)	4,000
1 Music room	1,200
1 School administration centre	900
1 Conference room[c]	150
1 Guidance centre	400
1 Health centre	450
1 Staff lounge (including kitchen, clothing storage)	850
Academic storage area(s)–central school storage	375
Pupil washrooms	1,500
Staff washrooms	200
Circulation allowance for ancillary areas	4,063
Sub-total, Net Ancillary Area	20,313

Service Area Requirements	
(783 pupils–16.5 Opportunity Class)[d] x 6 sq. ft.	4,600
Net Area at Ultimate Size, September, 1973	59,176

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[a] See footnote a, Table 6 (p. 72)
[b] Refer to footnote b, Table 6 (p. 72).
[c] See footnote c, Table 6 (p 72).
[d] See footnote a, Table 4 (p 71).

Comparison of Areas Required by SEF Recommendations with Area Allowance Permitted under the 1967 Ceiling Cost Formula at an Ultimate Enrolment of 828 Pupils

In Table 5 we saw that the Ceiling Cost Formula for 1967 allows an approved net area of 48,514 square feet (at the ultimate size of the school) using our simulated pupil enrolment of 828 pupils. Using the functional areas required in the SEF recommendations, the total net area required for this enrolment is 59,176 square feet (Table 7). This represents a difference of 10,662 square feet (net—exclusive of walls) between the 1967 Ceiling Cost Formula approved area allotment and the SEF area recommendations for this enrolment.

The differences between the SEF recommendations in net area and the approved areas permitted by the 1967 Ceiling Cost Formula at an ultimate enrolment figure of 828 pupils may be further broken down for purposes of analysis as shown in Table 8.

Table 8
Comparison of Net Area Requirements of SEF Recommendations and Approved Area Allowed by 1967 Ceiling Cost Formula at Ultimate Size of Simulated School

	SEF User Requirement Recommendations (in sq. ft.)[a]	Approved Area Under 1967 Ceiling Cost Formula (in sq. ft.)[b]
Instructional Area	34,263	29,350
Ancillary Areas	20,313	14,564
Service Area	4,600	4,600
Net Area of School at Ultimate Size, Sept., 1973	59,176	48,514
Instructional Area (Per-pupil Basis) (Basis: 783 pupils)	43.8	37.5
Ancillary Area (Per-pupil Basis) (783-16.5 pupils)	26.5	19.0
Service Area (Per-pupil Basis) (783-16.5 pupils)	6.0	6.0
Total Net Area on Per-pupil Basis	76.3	62.5

[a] The areas are calculated exclusive of walls, as required by the Ceiling Cost Formula.
[b] *Ibid.*

Therefore, the SEF recommendations fully applied would require these additional per-pupil space allotments for an ultimate enrolment of 828 pupils:

For Instructional Areas (43.8 sq. ft.—37.5 sq. ft.)	6.3 sq. ft.
For Ancillary Areas (26.5 sq. ft.—19 sq. ft.)	7.5 sq. ft.
For Service Areas (6 sq. ft.)	no change
Total Additional Net Area Required (Per-pupil Basis)	13.8 sq. ft.

The Application of the SEF Area Recommendations to Different Sizes of Elementary (K-6) Schools

Throughout this Chapter, SEF area recommendations have been simulated in relation to an elementary (K-6) school opening in 1968 with 550 pupils and increasing to an ultimate enrolment of 828 pupils in 1973. Members of our elementary school committees considered such an enrolment pattern to be ideal for an elementary (K-6) school.[11] These, therefore, were the enrolments simulated in Tables 6 and 7. For such a school, 76.3 square feet per pupil would be required at its ultimate size (Table 8). However, this figure should be considered only as a median and *not* as the per-pupil area required for all elementary (K-6) schools built in accordance with SEF recommendations.

Effects of varying enrolments on SEF area recommendations are illustrated in Table 9.

Table 9
Areas Required to Implement SEF Recommendations for Varying Pupil Enrolments in Elementary (K-6) Schools Based on Full Class Enrolment Figure at Ultimate Size of School

Ultimate Enrolment		Instructional Areas (Square Feet)	Ancillary Areas (Square Feet)	Service Areas (Square Feet)	Total Area (Square Feet)
Actual	Allowance				
1,362	1,242.5	42.3	24.9	6	73.2
1,112	995	42.4	24.5	6	72.9
801	717.5	42.3	28.9	6	77.2
506	472.5	41.5	32.2	6	79.7
457	407.5	41.8	34.7	6.6	83.1
261	252.5	42.2	59.9	11.4	113.5

In relation to the implementation of the SEF recommendations described in Chapter 6 and in Part 3 of this Report, the following conclusions may be drawn:

(1) The total school area required would vary by as much as 10 square feet per pupil for enrolments between 457 and 1362 pupils.

(2) For very small elementary schools (see 261 enrolment in Table 9), a disproportionate and greatly increased amount of area on a per-pupil basis would be required.

(3) The greatest variation in area would occur in ancillary spaces. For elementary schools with very low enrolments, these spaces would be much greater on a per-pupil basis.

(4) Such factors as partial enrolment in classroom areas, numbers of kindergarten or special education pupils, or special educational requirements could cause fluctuations in the total area required.

(5) Consideration might be given to altering the basis of the Ceiling Cost Formula from a fixed area per pupil to a sliding scale which would vary in response to the ultimate pupil enrolment of the school.

1. *SEF Area Recommendations and the Cost Factor*

As shown in the conclusions drawn from Tables 5 and 7 of this Chapter, there is a difference of 10,662 square feet (net area, exclusive of walls) between the 1967 Ceiling Cost Formula approved area allotment for an elementary (K-6) school at its ultimate size of 828 pupils, and the SEF area recommendations.

In Table 1 of this Chapter, it is shown that the approved unit cost (contract cost per square foot) in the 1967 Ceiling Cost Formula for an elementary (K-6) school in Metropolitan Toronto is $22.25. Therefore, the SEF area recommendations simulated in Table 7 for an ultimate enrolment of 828 pupils would result in an increase of cost for an elementary (K-6) school of approximately $237,000.

The main reasons for the SEF recommendations and the need to increase the area allotment (and hence increase the cost) of an elementary (K-6) school are briefly recapitulated in the following sections.

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[11] See p. 61

a. Additional or different kinds of areas
Such areas account in large measure for the increase of area shown in Table 8. These areas may be listed as follows:[12]

(1) a considerably enlarged library materials centre,
(2) a "common" or central participation area, a small seminar room, and a teacher workroom, together with an academic storage room—all serving the learning and teaching functions of each general learning area,
(3) a music room,
(4) a guidance and counselling area,
(5) a small conference room for the administration area,
(6) dressing rooms for the general purpose room.

b. Educational functions and user requirements
It would be repetitious here to enlarge on a theme we have constantly stressed in this Report: that educational requirements should be the major factor in determining what facilities are necessary. Over a six-month period, we have studied seriously the educational needs of the K-6 elementary school. We have related these needs to the present and the future. Our findings represent an overview of the research literature, as well as the considered opinions of the experienced educational personnel represented on our educational committees. We firmly believe that if we are to emphasize the learning needs of each individual child, more interior space, and more variable and flexible types of interior space, are needed in our elementary (K-6) schools.

In our opinion, the continuation of standard school design practices based on the traditional classroom and on educational concepts opposed to change will result in exorbitant rehabilitation costs within a very few years. School buildings should be designed to facilitate educational change. Only schools which are designed in accordance with this principle can meet future educational requirements.

c. A changed role for elementary schools and their teachers
Traditionally, elementary schools have been characterized by enclosed classrooms, a high pupil-teacher ratio, and a lack of specialist teachers. They have operated under the theory that an elementary school teacher should be "all things to all pupils." Over the years, this outlook has meant fewer upward area adjustments at this school level than at those higher school levels where teacher specialization and more varied and specialized teaching and learning areas are predominant features. Our recommendations are diametrically opposed to these design practices and to all educational theories which militate against change at the elementary school level.

2. *The Financing of Education*

The SEF research has not included a thorough financial study of the cost of education. The proportion of the gross national product that the public is able to allocate to education in relation to allocations to such matters as health and welfare, transportation, housing, police, and fire services is such a monumental problem that it must be resolved at the federal and provincial, as well as at the municipal level of government. The cost of education is a major challenge, but also major is the challenge to educational authorities to conduct education efficiently and effectively. Such studies as the Carter Report, the Smith Report, and those instituted by the Economic Council of Canada are attempting to effect closure on this series of problems.

This Report has emphasized ways of promoting efficiency and effectiveness in the learning-teaching environment of an elementary (K-6) school, and this has resulted in recommendations which would increase both the area required and the cost of construction. The local political authority must now decide the extent to which SEF recommendations can be implemented.

We suggest that a thorough annual review be undertaken by the Metropolitan Toronto School Board with a view to finding ways and means, over the next few years, of obtaining the objectives and area increases recommended by the SEF study. Among the many matters to be considered by such annual reviews should be that of the kindergarten area, where certain restrictive interpretations of the Ceiling Cost Formula exist.

We believe that if careful and thoughtful architectural design practices are followed, the overall area increase of 13.8 square feet per pupil[13] might well be considerably reduced. Conversely, poor design practices might increase this amount. The best and most economical school designs will be those whose educational functions the architect has fully grasped. The educator has the responsibility of detailing these functions for the architect as specifically and as completely as possible.

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[12] See pp 62-64.

[13] See Table 8 (p. 74).

Part 3

User Requirements for Elementary Schools

We believe that educational function, as evolved by the prime users—pupils and teachers—must henceforth determine the nature, size, and shape of a school's interior space.

North Bridlewood Public School, Scarborough.

Photo by Alex Gray.

Preface Section 3

The trends considered in Part 1 provide a sampling of the innovations to be found in elementary education today. The labels are arbitrary and the list is incomplete. Empirical evidence is often inconclusive. The general picture is one of seething, even frantic activity, but no clear overall pattern is evident.

Despite the discomfort of ambiguity, it is better to admit uncertainty than to jump to premature and inaccurate conclusions. No existing program can be enshrined as "The Answer" to all of the problems of today's elementary schools. Certainly, dogmatic prescriptions are out of order. A consistent and valid conceptual framework would be desirable, as would tight connections between theory and practice. But the option of waiting for more definite data is not available to those who are concerned about the kind of schools we are building today for tomorrow.

The Impact of Educational Change on Building Needs

Major changes are being initiated in the schools. Of these many will have increasing effects over the next few years. These facts dictate large-scale revisions in school design. The trend toward emphasis on individual learning needs, on "learning to learn" rather than fact mastery, on nongrading, on co-operative teaching, on flexible grouping all suggest need for varied facilities within a flexible container.

New school buildings for Metro must accommodate educational trends yet conform to the economic realities outlined in Part 2. Moreover, they must not place future educators in structural strait-jackets. Rather, they should be designed to permit easy and economical changes in interior space arrangements.

SEF Recommendations

The recommendations in Part 3 of this Report are therefore to be considered as guidelines. They are based on staff research into the educational literature, on deliberations with the SEF educational committees, on SEF staff visits to "lighthouse" elementary schools, and on the outcome of vigorous debates among SEF staff architects and academic researchers. The Ceiling Cost Formula and Legislative Grant structure have, of course, been given major consideration.

We are greatly indebted to many educators in Metropolitan Toronto who assisted us. Some 22 educational committees, representative of every level of educator in each borough of Metropolitan Toronto, met regularly from February to June, 1967, for the purpose of helping us to formulate the future educational needs of our elementary schools. While we are indebted to these committee members for much information and many suggestions, we of the Study of Educational Facilities assume fundamental responsibility for our Report.

Our major recommendation is for the use of large open areas to accommodate most school activities. The degree of enclosure within these areas will depend on school programs and personnel. We do suggest, of course, that there be some enclosed areas. The administration area, health centre, staff lounge, and service areas will, in most cases, be enclosed. Some programs—kindergarten, music, physical education and counselling—defy the use of the large open space. To some extent, this is also true of the library. Separate chapters have therefore been devoted to these subjects. Finally, because this Report is intended especially for Metropolitan Toronto, those trends which are particularly evident locally have been given special treatment.

The most significant general admonition we have to offer concerns the relation between function and form. We believe that educational function, as evolved by the prime users—pupils and teachers—must henceforth determine the nature, size, and shape of a school's interior space.

Implementation within the Boroughs

Each borough in Metropolitan Toronto will now be able to test the validity of various applications of the concept of open space. The degree of design change effected will depend largely on each borough's educational objectives and its readiness to implement current educational trends.

Chapter 8
General Learning Area

Many educators foresee the day when much of the interior area of a K-6 school will be a completely open zone of learning space with relocatable partitions or casework units providing the aural and visual separation among learning centres.[1] Whereas the traditional enclosed classroom accommodates one teacher and 30 to 35 pupils in an area of 750-900 square feet, each of these open areas would accommodate from two to ten teachers and from 60 to 300 pupils in areas of 2,000 to 12,000 square feet. The size and composition of pupil groupings would vary according to such factors as age range, achievement levels, aptitudes, interests, teacher ability, technological equipment, availability of learning space facilities, and the special needs of pupil and staff.[2] The predominant feature of such an interior would be its flexibility. Within it, any area could be enlarged or contracted readily and at relatively small cost. Such areas could be easily and inexpensively adapted to new requirements as educational functions and equipment requirements change.

What we have just described is known as the *open-space school.* Within such a school, the large, open areas are known as *general learning areas.*[3] This Report recommends the concept of the general learning area at the K-6 level.

For the immediate future, we believe each general learning area can be designed to accommodate 70 per cent of the educational activities of from 60 to 300 pupils. Because each general learning area would be self-contained, its pupils and teachers would be bound closely together in a "school-within-a-school" arrangement.

If we are to have general learning areas, architects will need to provide for longer structural spans and a completely flexible and interlocking system of partitions, lighting, mechanical services, casework, and furniture. Although corridors must satisfy safety regulations and building codes, the ingenious architect may find ways of cutting total space allotments for them below conventional levels.

So designed, we believe that general learning areas would provide appropriate physical facilities for the varied teaching and learning situations now being demanded by educators.[4]

The Sections of a General Learning Area[5]

The essential sections of a general learning area are

(1) teaching stations of approximately 750 square feet each,
(2) a common, or central participation, area of about 250 square feet per teaching station,
(3) a small project or seminar room of approximately 150 square feet (a flexibly enclosed area),
(4) a teacher workroom and academic storage room with an area allotment of approximately 75 square feet per teacher and teaching intern (a flexibly enclosed area),
(5) auxiliary areas (such as pupil washrooms, storage for outdoor clothing, and mechanical and service facilities).

1. Teaching Stations

Each teaching station should have approximately 750 square feet of floor area. Where necessary, it would be possible to enclose each station with arrangements of movable partitions or casework units. Each teaching station should be capable of accommodating up to 35 pupils, one teacher, and a teacher intern.

2. Common Participation Area

Space for the central common should vary with the number of pupils and teachers. We suggest an allotment of 250 square feet of space for each teaching station. For example, a general learning area containing six teaching stations (approximately 180 to 200 pupils and six or seven teachers), should have a central common area of approximately 1,500 square feet. This common area would provide an acoustical barrier among the several teaching stations and serve as a large-group facility.

3. Project or Seminar Room

An enclosed area of approximately 150 square feet is needed for many small group activities involving either a high noise level or a need for privacy.

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[1] American Association of School Administrators, Commission on School Buildings, *Schools for America* (Washington: American Association of School Administrators, 1967), p. 53. Cited hereafter as Schools for America.

[2] National Education Association, "Toward Improved School Organization," *National Elementary Principal*, XLI (Dec., 1961), p. 98.

[3] In the literature it is called by various other names as well. Some of these are big room, classroom cluster, school within a school, and zone of open space.

[4] See p. 62.

[5] See pp. 62-63.

A portion of one partition wall might be glazed for supervisory purposes, but it should be possible to darken the room for use of audio-visual equipment.

4. A Teacher Workroom and Academic Storage Area

This room should be enclosed by some form of demountable partitioning. It should provide suitable working space, filing space, and academic storage for both regular and intern teachers. (Apprentice or intern teachers would probably be in the ratio of one to every four teachers.) There should be 75 square feet for each teacher and intern teacher using the room. This room might be adjacent to the project or seminar room.

5. Auxiliary Area

Boys' and girls' washrooms and facilities for outdoor clothing should be included in the general learning area. Such auxiliary facilities might serve one or more adjoining general learning areas.[6]

Factors Relevant to the Design of the General Learning Area

At least seven related factors should be considered when designing a school containing general learning areas. These include (1) location, (2) future expansion, (3) space, (4) environment, (5) aesthetics, (6) technology, and (7) need for prior consultation.

1. Location

Noise level and easy accessibility are the two principal factors to consider in locating a general learning area.

A general learning area is best located in a quiet section of the school.[7] It should be removed or insulated from the noises of the general purpose room, music room, playgrounds, and outside traffic. Locations close to other general learning areas, the library materials centre, administration, counselling, and health centres are generally preferable.

Pupils assigned to a general learning area should have easy access to other related areas of the school—especially, for example, to the library materials centre and outdoor playgrounds. Internal space arrangements and the location of the general learning areas in relation to other school facilities should allow convenient circulation throughout the building.

Within each general learning area, convenient traffic patterns for pupils and teachers should be planned.

2. Future Expansion

Ideally, each general learning area should be adjacent to another, so that removal of walls between learning areas and between these areas and the library materials centre could create a completely open learning laboratory, should this be desired. It is equally important that each general learning area be capable of convenient subdivision into smaller units. Care should be exercised that neither the design and shape nor the location of stairwells or washrooms should interfere with expansion.

3. Space

A general learning area results when the space traditionally used by two to eight enclosed classrooms is combined to form an open area. The following "rules of thumb" concerning space allotments to these areas are intended as suggestions.

a. Number of pupils and teachers
The suggested pupil allotments to this area are in accord with current practices and the Metropolitan Toronto Ceiling Cost Formula. If, for example, a general learning area should consist of the pupils and teachers normally assigned to four enclosed classrooms, it would have to accommodate approximately 130 pupils and four teachers. Because current trends support increased use of lay assistants and apprentice teachers, designers should provide larger staff facilities. We suggest that a ratio of one assistant for every four teachers might be appropriate.

It has been estimated that the pupils would spend 70 per cent of their school hours in the general learning areas and 30 per cent in other areas such as the music room, the library materials centre, the general purpose room, or the playgrounds.

b. Circulation allowance
To calculate the amount of pupil circulation allowance for the general learning area, the reader is asked to refer to our simulation of the SEF user requirements in relation to the Ceiling Cost Formula in Chapter 7.[8] In general, our simulation provides 25 per cent of the general learning area for circulation. However, it makes a circulation allowance of 20 per cent of the total school area, as compared with a range of 18 to 28 per cent for conventional schools.

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[6] National Council on Schoolhouse Construction, *NCSC Guide for Planning School Plants* (East Lansing, Mich.: National Council on Schoolhouse Construction, 1964), pp. 76-84.

[7] Dariel Fitzroy and John Lyon Reid, *Acoustical Environment of School Buildings* (New York): Educational Facilities Laboratories, Inc., 1963), p. 27.

[8] See pp. 72-73.

As was suggested earlier, some architects may be able to achieve even lower percentages.

c. Relative sizes of general learning areas
Some educators suggest that younger children are overawed by large open spaces. They believe primary children need close ties with one teacher and would feel more secure with fewer teaching stations and a smaller common area. It is their opinion that only the older children in an elementary (K-6) school have developed the social skills and learning habits which enable them to work well in larger spaces.

In the final analysis, the educational plans of a borough's school design team will determine the size and shape of each general learning area. It is up to this design team to develop plans for general learning areas which will meet the needs of their pupils and teachers.

4. Environment

a. Sound
Because of the large number of pupils, the active, sometimes noisy, nature of their programs, and the use of audio-visual equipment in a general learning area, careful acoustic planning is necessary.
A normal voice must be clearly audible to a large group assembled in the central common, yet sounds generated in one teaching station must not interfere with activities in another. Carpeted floors, acoustically designed ceilings, and an operable or demountable partition system can be used to control sound.

b. Windows
Too many windows may produce excessive glare, extreme variations in lighting level, and uncomfortable temperatures. Other disadvantages of windows are loss of wall space and cost of drapes, blinds, and pane replacements. However, much professional opinion holds that children should have a visual link with the outside.[9]

Window design should permit the darkening of any section for audio-visual purposes.

c. Lighting
In all areas of the school, lighting should be provided as if no other light source were available. Illumination should be without glare or shadow.[10] Separate light switching devices should be installed for the various sections of the general learning area. Since this area of the school may frequently be rearranged or expanded, the lighting system should be sufficiently adjustable to allow change with minimum expense.

d. Climate control
The internal temperature of this area should always be comfortable, regardless of the outside temperature.[11] A satisfactory relative humidity level and a ventilation system freeing the area of odor and dust are basic requirements. To permit adjustment of temperatures to suit the activities of the children and teachers, zone temperature control is suggested.[12] Since young pupils will spend considerable time sitting and working on the floor, especially in the central common, draft-free floors which are warm to the touch are essential.[13]

The mechanical system should be carefully planned for flexibility. Similarly, the system should be easily adjustable to any rearrangement or expansion of the general learning area.

e. Color
Light colors increase light reflection and thereby improve the illumination levels of the area.
Room colors should be carefully selected to produce a stimulating environment.

5. Aesthetics

The general learning area should provide attractive surroundings. Everything that contributes to the general effect—casework, furniture, display centres, lighting and window systems, floor covering, and color—should help create an environment in which visual and functional unity are achieved[14] and in which children will enjoy their work.

6. Technology

In the section on educational technology in Chapter 5,[15] we mentioned the many devices which can help children learn more quickly and easily. Because use of technological devices is likely to increase, the general learning area should provide carefully planned service outlets. There should be facilities for direct video input and for computer-assisted instruction. There should also be a safe, simple method of using headsets with tape recorders and record players.

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[9] Architectural Research Laboratory, University of Michigan, *The Effect of Windowless Classrooms on Small Children* (New York: Educational Facilities Laboratories, 1965), p. 39

[10] U.S. Department of Health, Education and Welfare, *Environmental Engineering for Schools* (Washington: Dept. of Health, Education and Welfare, 1961), pp. 14-15.

[11] Iowa Center for Research in School Administration, *Thermal Environment and Learning* (East Lansing, Mich.: National Council on Schoolhouse Construction, 1967), p. 16.

[12] Joseph R. Ankerman, "The Thermally Related Environment and its Effect on Man," SER 2, *Environmental Evaluations* (Ann Arbor: University of Michigan, 1965), pp. 96-97.

[13] U.S. Dept. of Health, Education and Welfare, *op. cit.*, p. 36

[14] Schools for America, pp. 35-41

[15] See pp. 53-55.

The various sections of each general learning area should be provided with a readily visible clock and with intercommunication service.

7. Need for Prior Consultation

The preparation of educational specifications for school construction programs is rapidly becoming an important and highly specialized field. The educator should outline in detail the nature of the educational program, its objectives, the characteristics and activities of the school's users, and the kinds and amounts of space necessary to implement the desired educational program. Future needs should be kept in mind, as well as existing cost parameters.
Every opportunity for detailed consultation between educator and architect should be sought. In fact, the educator and the architect must think of themselves as a design team until all points at issue have been successfully resolved.

Educational Functions to be Served in the General Learning Area

1. The Teaching Function

In Chapter 3 we mentioned educational and technological trends which may modify the teacher's role. We believe the evolution of this role will involve variability in the composition and size of pupil groupings. Requirements will be extremely fluid, but teaching space should be provided for at least

(a) traditional groupings (30-35 pupils),
(b) larger groupings (50-200 pupils or more),
(c) smaller groupings (2-15 pupils), and
(d) one teacher, one pupil.

a. Traditional groupings
It is especially important that the general learning area should be capable of being subdivided conveniently into units of traditional classroom size (30-35 pupils). Because of individual differences among teachers and administrators and the inevitability of special circumstances, the option of the conventional classroom must remain available.

b. Larger groupings (50-200 pupils)
Pupils and teachers from the teaching stations might be assembled in the central common for many purposes. These might include opening exercises, group singing, pupil presentations (including small drama performances), listening to a visiting speaker, formal teaching which employs audio-visual devices, traditional formal teaching, educational television programs, and movies. Such grouping may, on some occasions, include all of the pupils in the general learning area. At other times, large-group presentations may involve only a portion of the total pupil group.

c. Small groupings (2-15 pupils)
This size would be entirely feasible in a co-operative teaching organization composed of regular teachers plus some teacher-intern assistants. Uses of such groupings are legion. For example, a concept taught to a large group could be reinforced and enriched by subdividing the large group into smaller groups led by intern teachers under supervision.

d. One teacher, one pupil
This size of teaching unit has always been desirable. The flexibility of the co-operative teaching team in a general learning area makes possible some teaching on a one-to-one basis.

2. The Learning Function

Increased learning opportunities could be provided in the general learning area. The following are examples:

(a) a number of learning activity centres, each accommodating approximately two to ten pupils, for specialized activities in social studies, language arts, science, mathematics, and arts and crafts,

(b) a listening-viewing (and later, a computer-assisted instructional) learning centre, accommodating approximately two to ten pupils,

(c) an enclosed project centre or seminar room accommodating approximately two to twelve pupils. Here an individual pupil or a small group might tape a planned presentation; view an 8 mm. or 16 mm. film; use the overhead or opaque projector; use a record player, tape recorder, or other listening and viewing equipment; work at charts, graphs, or models; make transparencies; or prepare a small dramatic performance.

3. Staff Needs

We have stressed the need for teachers to work more closely in the planning and sharing of instructional tasks and in evaluation of pupil progress.[16]
In terms of space, co-operative teaching plans have modest requirements. All that is needed, other than facilities for flexible grouping, is some provision for preparation and storage.

[16] See Chapters 3 and 5.

An enclosed teacher workroom and academic storage area should therefore be included.

4. Counselling Needs

Parents often wish to talk privately with one or more teachers about the progress of a child. In fact, many educators believe that reporting to parents in interviews is preferable to the use of the standard report card. Also, visiting psychologists or social workers will often wish to interview a child in the familiar surroundings of the project room in the general learning area.

A private interview area is therefore recommended.

5. Technological Needs

There is little doubt that the use of audio-visual and other technological devices will increase.[17] Because of its cost, it is particularly important that such equipment should be allocated, maintained, and stored in a manner calculated to ensure its efficient use.

For these reasons, therefore, space for the use and storage of audio-visual-technological equipment will be needed.

6. Auxiliary Facilities

To encourage the concept that the general learning area is a self-contained "school within a school," the area will require certain facilities which, in conventional schools, are generally shared by all the children in the school.

Boys' and girls' washrooms adequate for the number of pupils using each general learning area should therefore be included. Facilities for the outdoor clothing of the children assigned to the area should also be incorporated.

Suggestions for Accommodating Educational Functions in the General Learning Area

1. Teaching Stations

A teaching station could serve as the accommodation unit for one or more of the following educational functions:

(a) traditional groupings (30-35 pupils and one teacher),
(b) smaller groupings (2-15 pupils and one teacher),
(c) one teacher and one pupil,
(d) a learning activity centre (2 to approximately 12 pupils),
(e) a location for audio-visual-technological equipment use.

2. Common or Central Participation Area

This area could accommodate the following educational functions:

(a) a teaching and audio-visual presentation space for large groupings of 50 to 200 pupils or more,
(b) learning activity centres, each accommodating from two to about ten pupils for social studies, language arts, mathematics, science, and arts and crafts,
(c) teaching spaces for small groupings of two to about ten pupils,
(d) teaching spaces for one pupil and one teacher,
(e) listening-viewing centres (with headsets) to accommodate up to about ten pupils.

3. Teacher Workroom and Academic Storage Area

In our recommendations concerning teaching stations, we have suggested that teacher facilities there be kept to a minimum. Instead, we believe that an enclosed teacher workroom and storage area should be included in each general learning area. Such a teacher workroom and storage area might be adjacent to two general learning areas. If so, it should be large enough to accommodate all teachers in both areas. Its facilities would not be intended for other than teacher use.

Such a room should not be enclosed with bearing walls. Therefore, some form of operable or easily demounted partition system should form the enclosure. This would allow the teachers their privacy without in any way blocking inexpensive changes in interior design.

We believe that teacher training plans will change radically in the very near future. Teachers-in-training will probably be assigned for longer periods to work as apprentices or interns in our elementary (K-6) schools. Provision should therefore be made for work space for such teachers-in-training. We recommend, then, that for every four regular teachers assigned to a teachers' workroom in a general learning area there should be five work spaces.[18]

The teachers' workroom should offer convenient access to the central common of the general learning area. It might also be adjacent to the project or seminar room. For supervisory purposes, there might be a glass partition of minimum size, above the 30-inch level, which offers a view of the central common. Alternatively, this could be a windowless area. Its lighting and climate control should meet the specifications outlined earlier in this chapter.[19]

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[17] See pp. 53-55.

[18] See Tables 6 and 7 (pp. 72-73).

Table 10
A Summary of Educational Functions and Suggestions for their Accommodation in the General Learning Area

	Teaching Station	Central Common	Project or Seminar Room	Teacher Workroom	Storage
Traditional groupings (30-35 pupils and a teacher)	●	●			
Larger groupings (50-200 pupils or more)		●			
Smaller groupings (2 to about 15 pupils)	●	●	●		
One teacher, one pupil	●	●	●		
Learning activity centres (2 to about 10 pupils)	●	●			
Listening viewing centres (with headsets) (2 to about 12 pupils)		●	●		
Teacher planning and preparation				●	
Space for private parent-teacher interviews, etc.			●		
Use of audio-visual-technological equipment	●	●	●	●	
Storage of audio-visual-technological equipment	●	●			●

Suggestions for Furnishings and Equipment in the General Learning Area

1. Teaching Stations

a. Furniture requirements for teachers
If a teacher preparation room is provided as part of the general learning area, a teacher's desk will not be required in each teaching station. A small table and chair will be sufficient. Some teachers might also require a lectern, either table-mounted or free-standing.

If, however, a teacher preparation room is not provided, each teaching station should have a suitable teacher's desk, a chair, a two-drawer filing cabinet, and, if desired, a lectern.

b. Chalkboard and tackboard
About 25 to 30 lineal feet of chalkboard is a minimal requirement. If the chalkboard were installed in such a way as to allow horizontal sliding, its usable surface would be made considerably greater. If the chalkboard were magnetized, this would permit its use as a tackboard surface. Any partition system whose surface permitted chalkboard use

[19] See p. 83.

would be extremely functional. Map rails should be located along the top of chalkboard surfaces.

At least 25 to 30 feet of tackboard is required. Its height from the floor will, of course, be determined by the sizes of its pupil users.

c. Casework
Casework units should be so located that they will not hinder expansion or contraction of a teaching station. Pupil and teacher needs will determine the amount and heights of such casework. Adjustable open shelving would meet most requirements. It would be used to store up to 300 or 400 text and reference books, atlases, dictionaries, viewers, realia items, supplies, and a proportion of the audio-visual equipment needed in the general learning area. Some securable storage for expensive equipment may be required.

If a teacher preparation room is not provided, securable casework units for the teacher's supplies and personal effects are required.

It is suggested that all casework units should be movable.

d. Counter and sink
Some educators may wish to have a small counter and sink unit in each teaching station. If so, more space would be required in such stations. These sink units must, of course, be so located that they will not hinder future internal space changes. The surface of such counters should be water- and stain-resistant, and they should be of a height suitable for pupil use.

e. Technological requirements
Electrical outlets sufficient for audio-visual equipment will be required, some at the front and some at the rear of the teaching station. Each teaching station should have a television outlet as well as electrical outlets for the overhead projector and other audio-visual projectors.

A suitably sized and permanently located projection screen, adjustable to the requirements of various projectors, should be provided in each teaching station.

2. Common or Central Participation Area

a. Furniture and equipment
For large group purposes, furniture and equipment need not be extensive. If the floor is carpeted and free from drafts and allergy-producing qualities, pupils may sit closely together on the floor. Chairs for teachers, parents, visitors, or pupils could quickly be brought from other sections of the general learning area.

Sufficient electrical outlets for every kind of audio-visual presentation must be provided, and it should be possible to darken the central common for such purposes. The audio-visual equipment might be conveniently stored either in the academic storage room adjacent to the teacher planning room or in casework units located either in the central common or in the various teaching stations.

A movable and collapsible stage might be requested by some schools.

b. Learning activity centres
These would be normally located in the central common. Each will require interlocking table units and chairs for up to ten pupils. Each will also require a movable casework unit consisting mainly of open shelving and a movable display screen or easel.

The following are brief descriptions of suggested requirements for centres devoted to particular subjects.

In a social studies centre there might be six or seven small sets of assorted social studies textbooks (perhaps forty to fifty books), several reference atlases, historical and geographical reference books, road maps, contour maps, aerial photographs, stamp albums, a coin collection, a time line, models, globes, pictures, clippings, filmstrips, slides, and projectors or previewers. If a pupil wished to refer to a large wall map, he would find it in one of the teaching stations.

For a language arts centre 200 or more books would probably be needed. These would include stories, poetry, reference books, and periodicals. This centre might also contain a mechanically controlled reader or sets of programmed reading skill builders, a tape recorder, and a record player equipped with listening stations and headsets.

For a mathematics centre the requirements would likely include an assortment of measuring devices such as rulers, thermometers, balance scales, pendulums, and barometers; collections of materials to be counted, sorted, and compared; mathematical games and puzzles; a wide range of commercially prepared mathematical structural materials; geometric models, geo-boards, diagrams, charts, and graphs; three or four small sets of mathematics textbooks (40 to 50 books), programmed materials, a few reference books, and audio-visual equipment.

For a science centre materials and equipment might include dry cells, an air pump, magnets, a microscope, scales, an alcohol burner, a variety of glassware, thermometers, a hydrometer, a barometer, specimens of many kinds, an aquarium, a small terrarium, models, an incubator, and a few cages. Slides, filmstrips, appropriate projectors and previewers, reference books, magazines, and 50 to 75 science textbooks would probably also be required.

A science activity centre should be located near a water- and stain-resistant counter-top unit containing a sink and water supply. (A mobile science laboratory unit containing its own supply of water would be an acceptable alternative.)

An arts and crafts centre would require materials for drawing, modelling, painting, and paper cutting, plus dry and liquid tempera paint, modelling asbestos and clay, scraps of wood and plastic, many assorted sizes of paper, and arts and crafts reference books. Some centres might have a woodworking bench, a pottery kiln, a copper enamelling kiln, or even a loom or spinning wheel. Pupils might work at art tables or at portable free-standing easels.

The arts and crafts centre should be adjacent to a water- and stain-resistant counter-top unit containing a sink and water supply. Casework units with drawers and shelves, display screens, easels, and tackboard of appropriate height should be provided, as well as filmstrip projectors, slide projectors, and previewers.

3. Listening-viewing Centre

Whether it is associated with the learning activity centres just described or is a separate centre, a listening-viewing area should be located in the central common. A tape recorder and a record player, each equipped with listening station and nine headsets,[20] might be provided. Similarly, small previewers for filmstrips and slides could be provided at such locations.

For listening and viewing, pupils could sit at tables or on the floor, if it is carpeted. Appropriate casework units should be provided for storing the equipment and supplies.

4. Project or Seminar Room

All furniture and casework here should be scaled to pupil size. Sufficient seating and table space for up to twelve pupils would be needed. Casework units consisting of open shelves and some drawers would allow neat storage of equipment and supplies. A stain-resistant counter might be provided along one wall. A good supply of electrical outlets is required for the various audio-visual devices. At one end of the room, a small adjustable wall- or ceiling-mounted projection screen would be needed.

5. Teacher Workroom

Provision should be made for a desk, a teacher's posture chair, and a four-drawer filing cabinet as minimum equipment for every teacher and teacher intern assigned to the room. Much of this furniture could consist of built-in casework units with appropriate kneehole spaces. Every possible part of the walls above these work locations should be devoted to a combination of open shelving and cabinets with doors. Sufficient drawers for small supply items should also be provided. Since at least one typewriter should be supplied to the room, and since the room might be used for certain audio-visual preview purposes, a number of conveniently located electrical outlets would be needed. The room should be supplied with a wall-mounted electric clock and inter-communication service. A coat closet should also be provided.

Provision of a counter work surface along one wall of the workroom should be considered. Such a counter top should be durable and water- and stain-resistant.

In some workrooms, there might be a request for approximately ten lineal feet of table space for planning meetings. Such tables could be about 30 inches in width.

6. Academic Storage Area

This area might be included as part of the teachers' workroom or might be separated from the workroom by a partition. It would require open shelving from floor to ceiling on most partition surfaces, with perhaps a counter or a table unit for various work purposes.

Textbooks, audio-visual equipment, supplies of all kinds, and materials not currently in use could be conveniently and securely stored in this area.

7. Auxiliary Areas

Earlier in this Chapter, we recommended the inclusion of boys' and girls' washrooms and outdoor clothing facilities in the general learning area. One purpose of this was to provide a "school-within-a-school" environment. (The size of such facilities would be in direct proportion to the number of pupils assigned to a general learning area.) We also suggested that these facilities, as well as certain mechanical and service facilities, could be so located that they serve adjoining general learning areas.

The washroom facilities must, of course, meet local board of health and building code regulations.

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[20] According to reliable technical sources, listening stations equipped with more than nine headsets do not perform adequately.

All plumbing fixtures should be scaled to the size of the pupil users.

The outdoor clothing facility should be at or near an entrance to the general learning area. Hooks for clothing and places for overshoes are required. This area should be well ventilated. The floor might be tiled or carpeted.

8. Amount of Audio-visual-technological Equipment

On several occasions in this Chapter, reference has been made to the audio-visual-technological equipment needed for specific learning and teaching functions. At this point these requirements will be summarized.

Because of space and cost limitations, it is impossible to supply today's enclosed classrooms with the full complement of audio-visual-technological equipment. We suggest, however, that the greatly enlarged facility known as the general learning area could have a full range of audio-visual equipment, and that this would be highly beneficial to pupils provided there was careful and co-operative teacher planning and sharing of such equipment. The following scale of such equipment might be considered for a general learning area housing six teaching stations, or approximately 180 to 200 pupils and six to eight teachers and teacher interns:

1 sound projector (16 mm.), on a mobile cart
3 (super) 8 mm. cartridge projectors (with or without sound)
7 overhead projectors (one for each teaching station and the seminar room)
1 overhead projector (large room size)
1 opaque projector
4 filmstrip-slide projectors
3 television receivers (large screen) on mobile stands (with provision for more receivers as required)
2 small radios
4 tape recorders (with listening station provision and nine headsets)
4 record players (with listening station provision and nine headsets)
4 filmstrip previewers
1 large wall- or ceiling-mounted projection screen located in the central common and adjustable for various projector uses
7 wall- or ceiling-mounted room-size projection screens, one located in each teaching station and one in the seminar room, adjustable for various projector uses.

The above list represents the considered judgment of the SEF staff as to what is presently feasible. (Our audio-visual equipment committee has recommended a somewhat larger number of devices.) We suggest that for long holiday periods securable storage for audio-visual equipment be provided in the academic storage room.

Special Education

In Chapter 5, we discussed special education as a trend which has an impact on education for all children, especially through its emphasis on individual differences. We stressed, particularly, the kind of program which aims at development of the whole child.

Because of our belief that exceptional children should have opportunities for integrated study and interaction with normal children, we shall conclude this Chapter with some considerations concerning facilities for exceptional children that can be incorporated within the general learning area.

1. General Principles

Within the scope of this Report, it is not possible to make a detailed study of the characteristics of the many categories of exceptional children or to offer recommendations for the facilities most suitable for children in each category. It is, however, appropriate to refer to some general principles.

First, the notion of "educational predestination," which implies that not much can be done to improve the abilities of children, is being challenged and rejected.[21] The IQ is now considered, and rightfully so, as only one of several factors which are significant for special education programs.[22]

Second, learning areas for exceptional children should be operated in as normal a manner as circumstances permit. Integration is reciprocally beneficial. The handicapped child learns to take his place in a normal society, and normal children gain valuable experience in tolerance and understanding.[23]

Third, early recognition of exceptional children is imperative. Careful assessment by specialists from many disciplines must precede any attempt at classification of children. The child's progress should be periodically and regularly reviewed and required readjustments effected.

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[21] D.C.Blue, "Changing Views of Ability and Education," A Paper Presented to the Canadian Association of Professors of Education, June, 1966. (Mimeographed.)

[22] J.E.Bowers, J.Clement, M.I.Francis, and M.C.Johnston, *Exceptional Children in Home, School and Community* (Toronto: J.M.Dent and Sons [Canada] Ltd., 1960), p. 219

[23] W.B.Dockrell, "Provisions for Exceptional Children," *The Canadian School Principal,* ed. A.W.Reeves, John H.M.Andrews, and Fred Enns (Toronto: McClelland and Stewart, 1962), p. 228.

Fourth, exceptional children have an even greater need than other children for close contact with teachers and for individualized attention from teachers and specialists. This is greatly facilitated by keeping the pupil-teacher ratio low, and the Ontario Department of Education and the Metropolitan Toronto School Board recognize this in the grant structure.

Fifth, teachers of exceptional children must be emotionally stable, familiar with the philosophical and psychological principles of special education, specially trained, and ready to improvise.[24] It is their function to provide helpful, happy, healthful, and successful experiences for handicapped children: "The teacher's aim . . . is to assist the development of social realization, social competence, economic efficiency and civic responsibility in each child to the best of his ability."[25] The announcement[26] in September, 1967, that Ontario will soon have a teacher-training institution concentrating solely on special education is a welcome sign of the growing public concern for special education.

Sixth, teachers of exceptional children must provide an environment which is relaxed and unhurried, where each child feels accepted, respected, and wanted. This environment must also offer ample opportunities for experiencing success and satisfaction. Assignments should be neither too easy nor too difficult. Conditions of temperature, lighting, and sound should be carefully regulated, since their imbalance fosters restlessness.

Seventh, the teacher of exceptional children must have adequate accommodation, equipment, and materials. These must be designed to meet the needs of each specific category of exceptional children.

2. *User Requirements for Exceptional Children*

Suitable educational facilities for exceptional children may be grouped into three categories: (a) segregated facilities, (b) temporarily segregated and/or partially integrated facilities, and (c) integrated facilities.

a. *Segregated facilities*

On a proportionate population basis, there is only a small number of severely handicapped children. These are the totally blind and the totally deaf, the extremely disturbed, and the severely retarded. Generally, these children require separate and segregated facilities located in special hospital wings, residential schools, or day schools. Such children need specially trained teachers, specially designed facilities, and equipment not normally provided in elementary (K-6) schools.

b. *Temporarily segregated and/or partially integrated facilities*

Among exceptional children are some who are less severely handicapped than those described above. A majority of these children display some degree of emotional instability[27] or disturbance in perceptual abilities.[28]

The severely emotionally disturbed can be hyperactive and destructive. Poor motor co-ordination, hyperactivity, spatial disorientation, need to withdraw from the group, distractibility, poor impulse control, lack of initiative and independence, and distorted social relations are characteristics of some emotionally disturbed children which have implications for school planning.[29] For such children, schools generally provide temporary or partial isolation for different lengths of time, in the hope that they will ultimately be ready to join the mainstream.

It has recently been claimed that disturbance in perceptual abilities is probably the most frequent cause of learning disabilities in children.[30] Hyperactivity, distractibility, poor co-ordination, uneven patterns of learning disabilities, and emotional disturbance are mentioned as major weaknesses of perceptually handicapped children.[31]

As a second general principle for dealing with exceptional children, we have stressed that opportunities should be provided for exceptional children to share integrated study and living with normal children. The flexibly designed space of a general learning area could provide whatever degrees of integration are desired. The area has the capability of being divided into enclosed classroom areas. Alternatively, it can offer to exceptional pupils the learning facilities of the central common or the seminar room.

In teaching stations enclosed by operable or demountable partitions, emotionally disturbed children could work in small groups of from five to twelve pupils, with 55 to 65 square feet per pupil and a minimum of 450 square feet for even the smallest group.[32] This space allotment is necessary to avoid narrow aisles and too great a degree of physical proximity. A few individual carrels may be required for severe cases of emotional disturbance.

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[24] Ontario School Inspectors' Association, *The Education of Children With Handicaps*, Sixteenth Yearbook of Ontario School Inspectors' Association, 1960-61 (Toronto: Copp Clark, 1962), p. 167. Cited hereafter as Children With Handicaps.

[25] Malinda Dean Garton, *Teaching the Educable Mentally Retarded* (2d. ed.; Springfield, Ill.: Charles C.Thomas, 1962), p. 5.

[26] "To Give Special Training," *Globe and Mail*, September 6, 1967.

[27] E.Hampson, "Special Class Teacher," *B.C. Teacher*, XLVI (November, 1966), 68.

[28] A.Jean Ayres, "Perceptual Motor Dysfunctions in Children," Monograph, Greater Cincinnati, Ohio District Occupational Therapy Association Conference, 1964; and Marianne Frostig, *Distinguished Lectures in Special Education* (Los Angeles: University of California, 1962), p. 57.

[29] Louis Hay and Shirley Cohen, "Perspectives for a Classroom for Disturbed Children," *Exceptional Children*, XXXIII (April, 1967), 577-578.

[30] Frostig, *loc. cit.*, and Ayres, *loc. cit.*

[31] H.Carl Haywood, "Perceptual Handicap: Fact or Artifact?" *Child Study*, XXVIII (Winter, 1966-67), 15.

Closely related to educational requirements for emotionally disturbed children are those for the perceptually handicapped. Their program should be based on the principles of "decelerated movement, exclusion of non-essentials, pinpointing of the relevant, verbal accompaniment, and involvement of the senses."[33] The teacher's task is "to activate the currently inadequate areas of perception and to capitalize on the child's perceptual strengths."[34] Some of the materials needed in teaching stations for these children are easy puzzles, counting materials, beads, clocks, calendars, building blocks and pegboards. There should also be flannelboard and blackboard space, a walking beam, and a balance board. Musical activities and techniques like the "Body Alphabet" of Dr.Ralph Kershner of the Sick Children's Hospital, Montreal, can be used.[35] In some severe cases, concentration can be aided by using spacious portable carrels in a circular arrangement. These ensure visual shielding from classmates, while providing direct visual and physical contact with the teacher in the centre.[36]

Such teaching stations should be located in a quiet section of the school, preferably adjacent to washrooms and a grassy play area. Shapes of these stations would permit many kinds of activities without overstimulation of pupils. The area should be acoustically treated, and preferably carpeted, to eliminate harsh, loud sounds. Furnishings should be durable, easy to maintain, warm, cozy, and graceful. Heavy but movable furniture is best suited for hyperactive children and for those who suffer from spatial disorientation. Chalkboard and tackboard similar to that described for other teaching stations are required.[37]

c. *Integrated facilities*

Many exceptional children need only certain adjustments and modifications in the curriculum, in scheduling, and in instructional techniques, plus the provision of specialized equipment and materials. Enriched and accelerated programs for the gifted, special lighting and seating positions for those with impaired vision, hearing aids and taped materials for the hard of hearing, and special motor exercises and word-recognition drills for slow readers are examples. An understanding teacher and an individually tailored program will reduce feelings of inadequacy, anxiety, and frustration and at the same time satisfy the need for achievement and belonging.

A typical example of the exceptional child is the culturally disadvantaged child. Such children need help in acquiring self-understanding and feelings of personal worth through greater intellectual and social competence. However, there is no need to accommodate them in separate facilities. Planning for them should preferably start with "a qualitative analysis of intellectual function, from which analysis appropriate learning experiences and educational programs can be prescribed, designed, and executed."[38] They need an environment which is rich in its variety of materials and its sensory experiences, an environment in which each child is wanted and valued and has opportunities to work with others.

Slow learners (IQ 80-89) and the educable mentally retarded (IQ 50-79) display short attention span,[39] slow reaction time, limited vocabulary, underdeveloped sense of humor and concept formation, a narrow range of interest and initiative, and very little ability to plan or evaluate realistically. Some also have difficulty in recognizing physical and ethical limits.[40]

These children need intensive teaching on a long-range, slow-progress basis. They also learn better from concrete and varied experiences. It is generally agreed that they do better in a regular program with a specially trained and sympathetic teacher, where individualized instruction and learning are stressed. Emphasis should be on facilities for fostering good homemaking and occupational readiness. Because broad physical movements are important, proximity to an outside play area is desirable.

The concept of the general learning area seems to have much to offer these children. It can provide enclosed teaching-station space for those sections of their program where enclosure may be desirable. It can also provide them with the opportunity to participate fully in individualized learning opportunities within the central common and the seminar room.

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[32] Hay and Cohen, *op. cit.*, p. 579.

[33] S.Pearce, "Teaching the Perceptually Handicapped Child," *Canadian School Journal*, XLV (April, 1967), 31.

[34] *Ibid.*, p. 28.

[35] *Ibid.*, p. 29.

[36] Hay and Cohen, *op. cit.*, pp. 578-79.

[37] See pp. 86-87.

[38] Edmund W.Gordon, Review of *The Disadvantaged Child: Issues and Innovation*, ed. Joe L.Frost and Glenn R.Hawkes, *Harvard Educational Review*, XXXVII (Spring, 1967), 327.

[39] Children with Handicaps, p. 123; and David Zeaman and Betty J.House, "The Role of Attention in Retardate Discrimination Learning," *Handbook of Mental Deficiency*, ed. Norman R.Ellis (New York: McGraw-Hill, 1963), pp. 159-223.

[40] Garton, *op. cit.*, pp. 7-11.

Level K-6	Square Feet 250/ Teaching Station	Area Common Area	Page Number 93

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature outside temperature	> 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity outside temperature	> 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	± 10
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—

Odors Body, Chemicals

Population	max 8 sq ft/person	min 0

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	
	Projector	—	

Remarks

Double glazing

Floor should be free from drafts and comfortable to the touch.

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In Op'l	Blackout Yes	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	58	77	89	75	60

Acoustic treatment of floor and ceiling is recommended. Reverberation time calculation is not meaningful. Speech reinforcement may be required.

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain No	Exhaust See remarks	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 ϕ for AV equipment			
Other Consider induction loop system			

Remarks

If chemical experiments are anticipated special exhaust must be provided.

Consider separate control and use of local PA speakers in connection with AV equipment.

Notes

Multiple usage of wet centres shall be provided for.

Level K-6	Square Feet Varies	Area Teacher Preparation	Page Number 95

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.4 to 1.0	> 0.3
	CFM per person	20 to 30	> 15
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	± 10
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	$> 5\mu$	80%	> 65%
	$< 4\mu$	45% to 80%	—

Odors Body, Smoke			
Population	max 60 sq ft/person	min 40 sq ft/person	
Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout Yes	Privacy Yes
Daylight Op'l	Level Control Yes		

Consider carrel lighting.

Acoustic Criteria

Ambient Noise Level: NC 35 max.						
Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		
Generated Noise Level (in db re .0002 dynes/cm^2)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Consider smoke exhaust	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V—1 ϕ for office & AV equipment			
Other			

Remarks

Notes

Carrels, including book shelves and lockable storage space, should be considered for each teacher.

Level K-6	Square Feet 750	Area Teaching Station	Page Number 97

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	outside temperature < 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	outside temperature < 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	± 10
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—
Odors Body			
Population	max 36	min 0	
Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	
	Projector	—	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In Op'l	Blackout Yes	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max						
Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			0.5		
Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			77		

Impact noise is a considerable problem.
Acoustic treatment of the floor is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 ϕ for AV equipment			
Other Consider induction loop system			

Notes

Level	Square Feet	Area	Page Number
K-6	160 to 175	Seminar Room	99

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature outside temperature	> 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity outside temperature	> 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	± 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	± 10
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—

Remarks

Odors Body			
Population	max 12	min 2	
Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout Yes	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max						
Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		
Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No*	
Other			

Remarks

*If seminar room is used by adults outside school hours, smoke exhaust should be considered.

Electrical Services

PA Yes	Intercom Op'l	Handset Yes	Bell Tel No
Program System No		Clock System Op'l	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 φ for AV equipment			
Other			

Notes

Level K-6	Square Feet Varies	Area Circulation	Page Number 101

Environmental Criteria

Atmospheric Criteria

			Desirable	Tolerance	Remarks
Temperature	outside temperature	> 90 F°	78°	± 3°	
		$<$ 0 F°	72°	± 3°	
Relative Humidity	outside temperature	> 90 F°	50%	± 5%	
		$<$ 0 F°	30%	± 5%	Double glazing
Outside Air		CFM per sq ft			These are a function of plant layout.
		CFM per person			
Air Changes		per hour			
Air Movement		velocity: FPM	40	± 35	
Room Pressure		in. WG	+ 0.05 to + 0.10	$>$ 0.05	
Air Filter Efficiency		$> 5\mu$	80%	$>$ 65%	
		$< 4\mu$	45% to 80%	—	

Odors Body, clothing			
Population	max Varies		min Varies
Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 30
View Out Op'l	View In Yes	Blackout No*	Privacy No
Daylight Op'l	Level Control No*		

*If part of open plan, blackout & level control will be required.

Acoustic Criteria

Ambient Noise Level: NC 35 max if open plan 45 max if enclosed

Reverberation Time (in seconds)						
	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm²)						
	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Acoustic treatment of floor & ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust See note	
Other			

Remarks

If coat storage is incorporated in circulation space, adequate exhaust must be installed.

Electrical Services

PA Yes	Intercom No	Handset No	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V–1 ϕ for cleaning equipment			
Other			

Notes

Level	Square Feet	Area	Page Number
K-6	Varies	Washroom	103

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	80°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	> 2	—
	CFM per person	N/A	N/A
Air Changes	per hour	12 to 20	—
Air Movement	velocity: FPM	N/A	N/A
Room Pressure	in. WG	− 0.15	< − 0.10
Air Filter Efficiency	> 5μ	N/A	N/A
	< 4μ	N/A	N/A

Odors Toilet

Population	max —	min —

Heat Gain	source	watts	BTUH
	Lighting	1 to 2/sq ft	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 30
View Out Op'l	View In No	Blackout No	Privacy Yes
Daylight Op'l	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC N/A

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			N/A		

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain Yes	Exhaust Sanitary	
Other			

Electrical Services

PA No	Intercom No	Handset No	Bell Tel No
Program System No		Clock System No	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V–1 ϕ for cleaning equipment as req'd			
Other			

Remarks

Notes

Avoid attaching fixtures containing valves (particularly containing pressure actuated flush valves) rigidly on partitions separating washrooms from critical or semi-critical occupancy space.

Mirrors should not be placed over wash basins.

Chapter 9
The Kindergarten and Junior Kindergarten

The first year in school is a critical period in a child's growth. Initial experience and impressions leave indelible imprints which affect later growth and development. The attitude that a child develops toward education and toward life itself is frequently a reflection of his initial experience in Nursery School, Kindergarten or Grade 1.[1]

Throughout Metro, kindergarten programs have been popular for many years. Toronto has been one of the recognized leaders in the kindergarten movement since 1883, when the first public school kindergarten in Canada (the second in the world) was established in Louisa Street School.[2] Kindergarten programs in Metro today provide a wide variety of experiences and are intended to aid the development of the whole child. These programs are minimally structured and are designed to avoid distinctions between work and play.[3] Both the form of the programs and their underlying rationale are strongly supported by pre-school educators in many communities.[4]

Emerging Trends

The best type of kindergarten program has been widely debated.[5] Although much research has been done on schooling at the nursery and kindergarten levels, none of it is definitive.

The body of knowledge is spotty and difficult to organize and integrate. Interesting small facts abound but often are not clearly related to other facts in the same area.[6]

Research efforts were put forth in the 1920's, 1930's, and 1940's. Pioneering work on unstructured and semi-unstructured kindergarten and nursery school programs was done at Toronto's Institute of Child Study and in other centres. This work has had a marked influence on public school kindergartens. Recently, however, there have been investigations into the possibilities offered by different kinds of programs.

1. Early Cognitive Emphasis

Some of the impetus for research into structured kindergarten and nursery school programs has come from the attempt of the United States government to do something about massive poverty problems. Before the Poverty Program began, pressure for early cognitive emphasis had come mainly from middle class parents who wanted their children to learn more and learn it faster. Now, however, the pressure is coming from lower-class parents—or rather, from their governmental representatives. It is contended by some who promote special programs for the "culturally disadvantaged" that children from "deprived" backgrounds often enter Grade 1 with "insufficiently developed cognitive, sensory and language skills."[7] In comparison with middle class children, they also lack good working habits and the ability to listen and conform.

Some workers in this field believe that unstructured kindergarten and nursery school programs would help such children. Others, like the Harvard psychologist Jerome Bruner, say that these children can benefit greatly from "a structured, systematic pre-school enrichment and retraining program which would compensate or attempt to compensate for the difference in the slum environment."[8] There is some research which indicates the value of unstructured programs for later social and emotional adjustment, but conflicting evidence exists as to their value in relation to academic achievement.[9] Efforts to build readiness using unstructured methods have seldom been successful. Experimenters are now investigating the value of structured programs as an answer to the problem.

New approaches amount to radical departures. Professor Orville Johnson of Syracuse University recommends a kindergarten program that is "planned in small developmental steps," "direct," and "to the point."[10] Use of small, sequential steps resembles techniques basic to programmed instruction. Professors Carl Bereiter and Siegfried Engelmann[11] are developing a program to help culturally disadvantaged preschool children to "catch up in a hurry." They insist on the need for definite instructional objectives for these children and have outlined them carefully.[12] This program, labelled by one journalist "a pressure cooker for four-year-old minds,"[13] is based on deliberate and orderly stimulation of the child's intellect and on the "central role of verbal skills" as an instrument of learning and thinking. The Bereiter and Engelmann program "pushes" children, on the assumption that a little stress will do no harm as long as the children know what the rules are and as long as the problems are "geared to their capabilities."[14] The program emphasizes "direct instruction consisting of deliberately planned lessons involving demonstration, drill, exercises, problems and the like."[15]

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[1] Ontario Department of Education, *Kindergarten* (Toronto Ontario Department of Education, 1966), p. 6

[2] Toronto Board of Education, *Centennial Story 1850 to 1950* (Toronto Board of Education, 1950), p. 87.

[3] "The Activity Programme in Early Childhood Education," A Guide for Kindergarten Teachers Prepared by the Staff of the Kindergarten Department, Toronto Board of Education, May, 1967, pp 6-7 (Mimeographed) Cited hereafter as Activity Programme.

[4] Norma Law *et al., Basic Propositions for Early Childhood Education* (Washington, D C Association for Childhood Education International, 1965), and Helen Hefferman, *Let's Take Another Look! What is Good Education in Nursery School and Kindergarten?* (Sacramento, Calif California State Department of Education, 1964).

[5] Brief historical summaries of the evolution of kindergartens appear in. *Encyclopedia of Educational Research* (3d ed . New York Macmillan Co . 1960), pp 385-393, Bernard Spodek and Helen F Robison, "Are Kindergartens Obsolete?", *Elementary School Journal,* LXV (March, 1965), 300-305, and Judith Palmer, *'Pre-School' Education — Pros and Cons* (Toronto Research Department, Toronto Board of Education, 1966), pp 1-5

[6] Pauline E Sears and Edith M Dowley, "Research on Teaching in the Nursery School," *Handbook of Research on Teaching,* ed. N L.Gage (Chicago Rand McNally, 1963), p 858

[7] Martin Deutsch, "Social and Psychological Perspectives on the Development of the Disadvantaged Learner," *Journal of Negro Education,* XXXIII (Summer, 1964), 239 For a dissident view see Norman L.Friedman, "Cultural Deprivation. A Commentary in the Sociology of Knowledge," *Journal of Educational Thought,* I (August, 1967), 88-99.

[8] J S Bruner, "The Cognitive Consequences of Early Sensory Deprivation," *Sensory Deprivation,* ed P.Solomon (Cambridge Harvard University Press, 1961), p 203

[9] *Encyclopedia of Educational Research* (3d ed . New York Macmillan Co . 1960), pp 394-95

The Bereiter and Engelmann program was compared with a conventional curriculum in an experiment at Canton, Ohio in the summer of 1967.[16] Results were so favorable to the Bereiter and Engelmann program that it was adopted for use in the regular school year.

Another alternative to conventional kindergarten programs is the Montessori method developed in Italy early in the twentieth century. Despite the fact that Montessori's extraordinary successes were with slum children in Rome, London, and India,[17] the use of her methods in North America has until recently been limited to private schools. Montessori techniques are now being used successfully, however, to help break the cycle of failure for poverty-stricken children in the United States.[18]

2. *Metro's Non-English-speaking Children*

Although problems of poverty and integration are not nearly as intense or large-scale in Metro as in parts of the United States, the arrival of a continuing stream of non-English-speaking families[19] has created a situation which demands special attention. Metro's problem is closer, perhaps, to that of Israel, with its influx of children with many linguistic backgrounds. Israel's attempts to cope with this have evolved into a deliberate program of intervention to prevent school failure.[20] The possible value of the structured, intellectual approach for children from Metro's non-English-speaking homes cannot be overlooked.

3. *Differences of Opinion*

Not every educator, however, is willing to grant unqualified acceptance to the popular concept of "cultural deprivation" as the primary cause of low academic achievement.[21] Some researchers have recently claimed, for example, that the expectations of a child's teacher can play a significant role.[22] Moreover, many working professionals in the field of early education would resist highly structured programs on the grounds that children should be free to "enjoy" their childhood, that development must be "balanced," and that such programs may damage self-concepts, create learning blocks, and even lead to an increase in the proportion of teen-age drop-outs.

In attempting to decide upon the relative merits of the approaches we have outlined, it is useful to examine them against the background of current educational trends affecting the elementary school as a whole. If the concepts of vertical integration, horizontal integration, individual differences, and continuous progress prove as powerful as they now appear, there could be a meshing of structured and non-structured approaches.

The conflict between programmed instruction and the discovery method may be more apparent than real.

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[10] C.Orville Johnson, "Organizing Instruction and Curriculum Planning for the Socially Disadvantaged," *Journal of Negro Education,* XXXIII (Summer, 1964), 259.

[11] Both were previously at the Institute for Research on Exceptional Children, University of Illinois. Professor Bereiter is now at the Ontario Institute for Studies in Education.

[12] Carl Bereiter, "Instructional Planning in Early Compensatory Education," *Phi Delta Kappan,* XLVIII (March, 1967), 359. Also, Carl Bereiter and Siegfried Engelmann, *Teaching Disadvantaged Children in the Preschool* (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1966), pp. 48-49.

[13] Maya Pines, "A Pressure Cooker for Four-Year-Old Minds," *Harper's,* January, 1967, pp. 55-61.

[14] *Ibid.,* pp 58-59.

[15] Bereiter and Engelmann, *op. cit.,* p. 63.

[16] Maya Pines, "Slum Children Must Make Up for Lost Time," *New York Times Magazine,* October 15, 1967, p. 72.

[17] *Ibid.,* p. 87.

[18] Martin Mayer, "Schools, Slums and Montessori," *Commentary,* June, 1964, p 33. Also, Pines, *op. cit.,* p. 82.

[19] According to 1961 census data, about one third of Metro's population is foreign-born. The mother tongue of about one quarter is other than English. See Anthony H.Richmond, *Immigrants and Ethnic Groups in Metropolitan Toronto* (Toronto: Institute for Behavioral Research, York University, 1967), pp. 7 and 13.

[20] Haim Adler, "Education and Ethnic Origin," *Symposium on Ethnic Integration* (Jerusalem: Hebrew University, 1966). (Original in Hebrew English abstract in *Selected Bibliography of Israeli Educational Materials,* I (B), 1966, pp. 7-8.) See also S.Smilansky, "Progress Report on a Program to Demonstrate Ways of Using a Year of Kindergarten to Promote Cognition Abilities, Impart Basic Information, and Modify Attitudes for Scholastic Success of Culturally Deprived Children," Unpublished report, Szold Institute, Jerusalem, 1964

[21] Friedman, *loc. cit.* (See footnote 7.)

[22] "Study Indicates Pupils Do Well When Teacher Is Told They Will," *New York Times,* August 8, 1967. The article describes results of a study by Professor Robert Rosenthal of Harvard University.

> *At the heart of both (as well as of the Montessori method) is a conception of instruction as something teachers do* for *students rather than* to *them, for all these methods approach instruction by trying to create an environment that students can manipulate for themselves.*[23]

Despite this, a major public and professional debate about the direction of early childhood education appears imminent.

4. Junior Kindergartens

Although the advantages of a junior kindergarten program for all children can be argued, the junior kindergartens within our local public school systems have, to date, been reserved almost entirely for children who are in some way circumstantially disadvantaged. In March, 1967, the Metropolitan Toronto School Board approved the opening of junior kindergartens in selected school districts.

> *It is desirable that junior kindergarten classes be provided in all junior public schools. However, since it is necessary to give a priority to the areas of greatest need... two criteria have been established and will be applied on a temporary basis....*[24]

The two main selection criteria were an average family income of $4,100 or less, or a high proportion of non-English-speaking children.[25]

Despite the problems of utilization[26] and finance, and despite the fundamental question of benefit,[27] the trend appears to be toward the provision of junior kindergarten for all four-year-old children.

5. Co-operation of Teachers, Assistants, and Parents

Quality in education is closely related to the teacher and the pupil-teacher ratio. This is especially true in early childhood education, where pupils require considerable individual attention. The Association for Early Childhood Education suggests that there should be "one professional teacher and one non-professional helper for 15 children of [junior kindergarten] age; one professional and [one] non-professional helper for 18-20 pupils of kindergarten age, and [one] non-professional helper for 20-25 pupils of primary school age."[28] While these ratios cannot be achieved in the immediate future, lay assistants are now provided in some kindergartens and pupil-teacher ratios are constantly being reviewed. Lay assistants might be expected to compensate for high pupil-teacher ratios, provided that physical facilities are adequate for the number of adults and children involved.

In many Metro schools, parents of kindergarten children frequently come to classes to observe their children and to discuss with the teacher aspects of child growth and development. In future schools provision should therefore be made for several adults to participate in and/or observe the kindergarten program.

6. K-13 Integration

Today many kindergarten programs are independent of what goes on in the rest of the school. In many instances, the kindergarten operates as a wholly autonomous unit within the larger organization. The theoretical and operational isolation of the kindergarten is often reflected in its facilities.

The desirability of this state of affairs is being questioned by advocates of continuous progress and of a fully integrated curriculum. (See Chapters 2, 4, and 5.) Similarly, a closer relationship between the kindergarten and the rest of the system is implicitly endorsed by those parents who want their children to learn as much as possible as soon as possible.

The trend toward integration is proceeding slowly. We have found no indication of a speed-up of the process on the local scene. In the immediate future, therefore, most kindergartens can be expected to operate largely as self-contained units.

Users and their Characteristics

Junior kindergarten classes currently consist of up to 20 four-year-olds. These pupils are generally aggressively active in their play, self-centred, and prone to temper tantrums. They are still highly dependent upon adults. They have insatiable curiosity and tend to move frequently from one activity to another. Although they engage in parallel play, they find it difficult to play co-operatively. Their experimentation with language often results in imaginative, if vague, use of words.

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[23] Charles E.Silberman, "Technology is Knocking at the Schoolhouse Door," *Fortune*, August, 1966, p. 198.

[24] Minutes of the Metropolitan Toronto School Board, March 7, 1967 (Appendix), p. 133

[25] *Ibid*

[26] According to a study by the Research Department of the Toronto Board of Education, the provision of junior kindergarten does not assure utilization. (Toronto Board of Education, *Study of Achievement: Junior Kindergarten; Who is Served and Who Goes*, A Report Prepared by the Research Department, 1965), p. 18.

[27] See Palmer, *op. cit.*, pp 8-18, and Judith Palmer, *The Effects of Junior Kindergarten on Achievement the First Five Years*, A Report Issued by the Research Department, Toronto Board of Education (Toronto: Toronto Board of Education, 1966)

[28] Law *et al*, *op. cit.*, p. 9

Senior kindergarten classes currently consist of up to 30 five-year-olds. These pupils are generally larger, more independent, less physically active, better co-ordinated, and more stable emotionally than junior kindergarteners. They manifest emerging abilities in co-operative group activities and longer spans of concentration. They are beginning to speak in sentences containing fairly specific terms, and their aural and visual discrimination is becoming acute.

The range of individual differences is great, and there are many junior kindergarten pupils who display greater overall maturity than some senior kindergarten pupils.

Teachers, lay assistants, and parents are other users of the kindergarten. Their needs and convenience should also be considered. Facilities that will be used exclusively by the adults in the room should be scaled to their size and built to their requirements.

Kindergarten Activities

The goals of conventional kindergarten programs are so numerous, so broad, and so interrelated,[29] that there is almost no educational activity which is excluded. The overall aim could be said to be the provision of opportunities for each child to have as many and as varied experiences as possible. Because the learning process is essentially the same for four- and five-year-olds, the methods, materials, and programs of junior and senior kindergartens are similar.

1. Grouping of Pupils

Most of the activities in the kindergarten are performed individually or in small groups. The whole group of children comes together for comparatively short periods for a song, a story, a movie, or a discussion. At such times, the group occupies a relatively small area on the floor. If there are rest periods, pupils spread out over the floor space in every part of the room which can be easily supervised.

Because most kindergarten teachers try to keep group routines to a minimum and to provide children with some opportunity to select activities for themselves, grouping arrangements are fluid. The number of pupils engaged in a particular activity at any time is determined by the nature of the activity, availability of materials, pupil interest, and teacher intervention. (Most teachers intervene to ensure that all pupils have a turn at available activities over the course of several months.) These variables make the duration of pupil engagement in a given activity indeterminable.

2. Arrangement of Materials

Clusters of functionally related materials are commonly referred to as activity centres, interest centres, or learning centres. Some of these clusters (such as those for blocks, artwork, music, playing house, and reading) are relatively clearly defined and permanent. Others concerned with safety, science, social studies, health, mathematics, or special events are often transitory and diffuse. They generally increase in number and size during the school year. The variety of the clusters and their relative state of development depend primarily on the ingenuity of the teacher and the interests and home resources of the pupils.

Because a major purpose of the kindergarten program is to allow the pupils to make choices and to participate in the design and conduct of their own learning environment, and because of the unstructured nature of the program, no specific descriptions of activity centres can be given. The architect must rely heavily upon consultation with teachers and upon the factor of flexibility in furnishings and equipment.

The following daily schedule[30] is not presented as representative, but rather as an illustration of a type of program conducted in many kindergartens. It is hoped that it will give the planner some feeling for the diversity and simultaneity of kindergarten activities.

9:00-10:00
Entry. Opening exercises. Outdoor play to engage in large-muscle play activities. Equipment used: wagons, bicycles, climbing apparatus, balls, hoops, sand, large blocks, etc. Creative play using empty cartons, cash registers, play money, fireman's hat, etc. is often included.

10:00-10:15
Conversation, songs, and/or creative movement with the group as a whole.

10:15-11:15
Activity period. (Juice and toilet routines are carried on individually during this period; the juice and cookies are left in a familiar place for children to serve themselves when they wish.) Activities might include large and small block construction, sand and water play, experimenting at the science centre, painting, coloring, modelling, cutting and pasting, exploring at the interest centres, listening at the

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[29] Neith E. Headley, *Foster and Headley's Education in the Kindergarten* (4th ed.; New York: American Book Company, 1966), pp. 44-45.

[30] This schedule was constructed from sample time-tables in Activity Programme, pp. 2-6.

music centre, playing with construction toys, box and wood sculpture, and reading. The many choices of interest centres and art activities would not all be available to pupils at the same time.

Throughout the activity period, the teacher works individually with children in an attempt to achieve developmental objectives of the program. At the beginning of the year, only one or two simple art media would be introduced at any one period. As the children become more mature and as routines become established, two, three, or four art media might be made available to them. Blocks and some construction toys and puzzles are always available. Interest centres are of different types, and they are often changed. Only two or three of these might be available at any time. The children engage in these activities singly or in small groups. In the senior kindergarten program the choice of activities is usually greater.

11:15-11:30
Rest. (Plastic mats or towels brought from home are often used for the children to lie on.)

11:30-11:40
Story or movie with the group as a whole.

11:40-12:00
Dismissal.

If the gymnasium is available to the class, rhythmic movement and large muscle activities are practised there once or twice a week.

General User Requirements

In many respects, the kindergarten room is a school in microcosm. Kindergartens usually have their own off-street entrance, outdoor clothing area, and toilet facilities, plus a small library and a separate outdoor play area.

1. *Location*

The location of the kindergarten area should receive careful consideration. The active, often noisy nature of the kindergarten program, its dependence upon outdoor play space, and the growing importance of parent participation are relevant factors.

The kindergarten should have an outside entrance to permit easy, safe access to the room and to facilitate use of the adjacent outdoor play area. To enter their own room, kindergarten children should not be obliged to cross areas used by older children. Moreover, their room should be removed or insulated from distracting playground and street noises.

Because junior kindergartens are being added to many schools in Metro and because kindergarten enrolments in some districts are rising, more elementary schools will be likely to have three or four kindergarten rooms. In such cases, the kindergarten rooms may be grouped together in a wing of their own, or each kindergarten may be located close to a primary grades area. Where a wing of the school is solely occupied by a cluster of kindergarten classes, the use of operable walls offers many advantages. A kindergarten wing might contain a small walk-in storage room, a small teacher workroom or parent interviewing room, and casework units for outdoor clothing. To provide these extra amenities, it may be justifiable to reduce the size of each of the classrooms proportionately in accordance with the Ceiling Cost Formula. A cluster of kindergartens might also share the use of one larger and better equipped outside play area.

While some educators will wish to have a kindergarten wing, others will prefer an arrangement which, in their opinion, is better adapted for promoting such concepts as continuous progress, the integrated curriculum, and co-operative (intergrade) teaching—that is, location of each kindergarten adjacent to an area occupied by primary children.

2. *Space and Expansion*

It is recommended that junior kindergarten rooms should contain not less than 1,000 square feet of total space and that senior kindergarten rooms should contain not less than 1,200 square feet. (A 1961 survey of kindergarten classes in the United States found that 1,200 square feet was about an average size. Many kindergarten classes, however, contained from 1,400 to 1,600 square feet of floor space.)[31] This area comprises all indoor space, including washrooms, pupils' clothes closets, teacher's closet, work counters, and walk-in storage facilities.

Because they are difficult to supervise, L-shaped rooms should be avoided, as should long narrow rooms, which cannot be conveniently organized into centres of interest. Square or nearly square rooms are currently preferred by teachers because they give ease of supervision plus flexibility in arrangement of interest and play centres.

A recent statement by the Association for Childhood Education International indicates that current SEF area allotments are absolutely minimal:

[31] U.S. Department of Health, Education, & Welfare, Office of Education, *Functional Schools for Young Children* (Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, 1961), p. 15

A kindergarten class of about fifteen children is increasingly accepted as being of manageable size. The comprehensive program designed for a class of this number of curious, vigorous and lively kindergarteners requires a minimum of 1,500 square feet of unobstructed indoor floor space and 15,000 square feet of outdoor space.[32]

It should be repeated here that current practice in Metro is to assign 20 pupils to a junior kindergarten and 30 to a senior kindergarten. While an increase in size of the kindergarten room is obviously desirable, this demand must be weighed against the need for additional space for better libraries, gymnasia, counselling, music, and general learning areas.

Area allotments for kindergartens may be increased at some future time. However, a more immediate probability, owing to the trend toward junior kindergartens, is an increase in the number of kindergarten rooms. It is also possible that area allotment per child might be increased by policy changes reducing pupil-teacher ratio. Any major change in such ratios would, of course, increase the number of kindergarten rooms required.

Specific User Requirements[33]

1. Basic Facilities

a. Flooring
The whole area should be covered with an easily maintained, durable flooring which does not induce allergies. The flooring should contribute to sound control and at the same time provide a comfortable work and sitting area. Wall-to-wall carpeting may meet these requirements.

b. Walls and doors
As far as possible, walls should be designed to serve as display areas. It is especially desirable to have plenty of display space at the eye level of the children. Doors should be safe and easy for young children to use.

c. Toilets and sinks
Separate toilet rooms for boys and girls, each containing one toilet of suitable height, should be included in every kindergarten. A low, easily accessible sink with drinking fountain attachment should be placed in each classroom. A large, deep sink of a height suitable for the teacher should be set in a wide, durable, water-resistant counter top with enclosed cupboards below it.

d. Chalkboard and tackboard
About ten lineal feet of chalkboard is usually sufficient. Thirty or forty lineal feet of tackboard should be provided if possible. Tackboard should be located at two different heights. Most of it should be at pupils' eye level, but ten lineal feet on a higher level would be useful for long-term displays.
A display rail with hooks or clamps along the upper edge of the chalkboard would also be useful.

e. Electrical and electronic services
Electrical and electronic services should be readily available to all parts of the kindergarten area, both indoor and outdoor. Allowance should be made for direct video input and for a safe, simple method of using headsets with a tape recorder or record player.

f. Furniture
Furniture for kindergarten classrooms should be scaled to the users. Flat tables, each accommodating three or more pupils, are recommended because they may be grouped in many different shapes and sizes to suit a variety of activities.

2. Equipment and Materials

Kindergarten equipment and materials are clustered in functionally related sets. Some are located around large or relatively stable objects such as the sink, work bench, playhouse, or piano. Others, consisting mainly of numerous easily portable and storable objects such as games, pictures, and collections, require only storage space and floor or table space. Some activity centres which are most commonly found in kindergartens will be briefly described,[34] but for detailed information the reader is referred to the sources listed in footnote 33, especially *Foster and Headley's Education in the Kindergarten.* Since many of the activities are based upon children's interests and maturity, there is every likelihood that different centres will be found in different classrooms, arranged in accordance with the plans of the teacher and children and the space afforded by the room.

a. The book centre
This centre should be located in a secluded area. It should contain a table, four or five chairs, a small book storage and display area, and about 20 square feet of tackboard. If the floor is not carpeted, a rug would be desirable.

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[32] Association for Childhood Education International, *Toward Better Kindergartens* (Washington, D.C.: Association for Childhood Education International, 1967), p. 33.

[33] The serious reader is referred to the following sources for more complete information: Headley, *op. cit.*, pp. 77-125, 239-258, 271-281, 289, 293-304, and 428-445; Activity Programme, pp. 11-23; Association for Childhood Education International, *op. cit.*, pp. 33-40; Ontario Department of Education, *op. cit.*, pp. 17-20 and 89-93; and Sarah Lou Hammond *et. al.*, *Good Schools for Young Children* (New York: Macmillan Co., 1963), pp. 323-340. (The Headley book is the most complete and explicit.)

[34] Equipment lists and arrangements are based mainly on information derived from Activity Programme, pp. 11-23.

b. The music corner

This area might include a piano,[35] a record player and/or tape recorder with headsets, dulcet chimes, maracas, tambourines, tone blocks, and shakers or triangles. The instruments might be situated on a low table surrounded by one or two chairs and an easel.

c. The art centre

This facility should be close to a teacher's sink and a children's sink. The teacher's sink counter might serve as a distribution centre for children's paint cans, paper, and brushes, and as a drying area for children's painting and clay or paper sculptures. Its cupboards might be used for storing bottles of liquid paint, a variety of paint tins and brushes, sponges, children's aprons, plastic desk covers, and packages of paper from 12" x 18" to 24" x 36" in size.

d. Other small-group activity centres

Water play is now being recognized as an important kindergarten activity. A portable clear plastic water container measuring about three by two by about two feet deep is often used. Such containers are usually stored near the teacher's sink. A pail, a funnel, plastic tubing, a baster, measuring cups, spoons, basins, and a collection of articles that float or sink are examples of other water play equipment.

Many small-group activities take place on the floor. Block building and small wheel toy play, for example, occur in any open place that affords the floor space required for the activities. As the year progresses, "forts," "houses," "submarines," "jet planes," or "space ships" will be constructed from large and small blocks by groups of three or four of the more mature children in the class. When certain props, such as toys, adult wearing apparel, or puppets are added, the block construction area then becomes a play centre involving more children. Puzzles and construction toys such as Aktiplay, Raufix, Bygg, Brio, Lego, and Tinker Toy may be used at one of the groups of tables throughout the room or in a convenient place on the floor. Artwork can be done on flat tables, on the floor, or on easels.

e. Transitory interest centres

A table, two or three chairs, and perhaps an easel can provide a centre for objects which appeal to a child's senses of taste, touch, smell, and visual acuity. A pet in a cage, a collection of rocks, or a flat of seeds, supplemented by relevant books and pictures, are examples of the objects around which such centres of interest may be formed.

f. Other interest centres

Before any activity centres such as the science centre, mathematics centre, or doll centre are established, the teacher will decide where they might most effectively be set up. Active centres like the doll centre or work bench might be located near the quieter book centre. Centres for such activities as block play, music, art, or construction should be located near the counters, sinks, or cupboards from which materials may easily be obtained.

g. Audio-visual equipment

Each kindergarten requires an 8 mm. cartridge type viewer, an 8 mm. film projector and screen, a television receiver, and a supply of records, tapes, and filmstrips. A 16 mm. film projector and screen and a slide projector should be easily available but could be shared.

Although most current kindergarten programs are based almost exclusively on concrete materials and imaginative play, it seems likely that use of AV equipment will increase.

3. Storage and Casework

Teacher convenience is associated with abundant and appropriate cupboards and shelving. As teachers often use casework units in forming activity centres, these units should move easily and safely but should also lock firmly into place. Tackboard on the backs of casework units would provide display areas. Tops might serve either as display or work counters.

Most teachers will probably find a walk-in storage closet useful. If three or four classes are grouped together, it would be desirable to provide a large common walk-in storage facility.

Practically all equipment and materials must be stored at some time. The casework must be flexible enough to accommodate small blocks, puzzles, games, and construction toys; art supplies such as modelling material, dry and liquid paints, brushes, scissors; odds and ends such as boxes and pieces of scrap wood; and many collections.

One or more sections of shallow plan files would be appropriate for storing assorted sizes of paper. Space is needed for such items as a paper cutter, a primary typewriter, and audio-visual equipment. Similarly, there must be storage facilities for learning materials such as the microscope, the balance, and dulcet chimes. Large equipment items such as tricycles, wagons, scooters, and balancing boards are often kept in an outside storage area. Large blocks are usually stacked on the floor.

Casework should be designed to facilitate pupil use of some shelving and cupboards. Shelving and cupboards should encourage, not thwart, early pupil attempts at responsible, independent action.

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[35] Some authorities question this

Classroom routines determine where equipment is kept and how pupils are expected to obtain and return it. Pupils' clothes closets with storage shelves should also be designed to promote self-reliance. These should be situated in a well ventilated place and, if movable, can serve as space dividers.

It is probably impossible to provide too much casework for a kindergarten.

Environment

1. Climate Control

Heating, cooling, ventilation, and humidity controls should ensure a healthful climate that is suitable both for physically active periods and for quieter times of the day. Because pupils spend considerable time sitting on the floor, draft-free floors that are warm to the touch are mandatory.

2. Fenestration and Lighting

Low-level windows that form a link with the outside world are recommended for the kindergarten room. These should have wide window sills at the child's elbow level. Natural and artificial lighting should be of the highest quality. Provision for reducing the lighting level will assist in management of rest periods and in the use of some audio-visual devices.

3. Sound Control

The active nature of the kindergarten program and the frequent use of noisy equipment require a careful acoustic treatment. Both sound-deadening measures and good tonal qualities are important.

4. Aesthetic Considerations

The kindergarten room should be a healthy, pleasant, and stimulating place. Its design should promote efficiency and convenience. The entire room, including casework, learning centres, and display areas, should be aesthetically vital and appealing to the children and adults who use it.

5. The Outdoor Area

The educator, the architect, and the landscape designer should co-operate to ensure that the kindergarten play area is a convenient extension of the indoor facilities.

The Department of Education for Ontario has made the following suggestions for kindergarten play areas:

A playground area should be provided for the sole use of kindergarten pupils. An allowance of 2,000 square feet of playground for each [kindergarten] room is suggested. The area should be fenced off from the remainder of the school grounds by a hedge or shrubbery. It is desirable that kindergarten pupils enter [their playground] area directly from the sidewalk without crossing the general playground. Most of the area should be sodded. Part of the area should be hard surfaced and a small plot set aside for digging and planting. The kindergarten playground should not be in front of other classrooms.[36]

The kindergarten play yard must be designed and equipped in accordance with its function of providing for active and spontaneous play.

The amount and variety of the play facilities and the space provided for each activity should allow full pupil participation without undue competition either for equipment or for space. All facilities should be sturdy, durable, and free from safety hazards such as splintered surfaces or protruding edges. Equipment should be so placed that children using it are easily supervised by the teacher.

Materials offering a variety of play possibilities are desirable. Examples are an old boat, a climbing apparatus, a slope for rolling or sliding, sand pits, an imaginative sculptured form, large blocks, bridges, and tunnels. There should also be play niches for quiet personal games. An adequate, suitably surfaced location for running, skipping, ball bouncing, hoop rolling, and wagon and tricycle riding should also be provided.

Other desirable features include some trees (for shade and perhaps for climbing), some shrubbery (for its aesthetic value, its nature study interest, and the seclusion it offers), and a surface area which provides different textures and materials such as rough sand, gravel, grass, and concrete and/or asphalt. A few benches made of heavy, durable material would also be useful.

Storage is an important factor. Each kindergarten play yard should possess a securable storage box or cabinet for equipment that is kept outside.

Although the kindergarten playground should be separated from the rest of the school site, it must nevertheless be designed to blend with the whole so that an overall impression of order and attractiveness is presented.

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[36] Ontario Department of Education, *Suggestions for the Layout and Construction of Schools in Ontario*, 3d. ed. (Toronto: Ontario Department of Education, 1962), Section 205.

Level K-6	Square Feet 1200 (1000 for JK)	Area Kindergarten	Page Number 113

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	15 < 40
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5μ	80%	> 65%
	< 4μ	45% to 80%	—

Odors Body

Population	max 35	min 0

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	
	Projector	—	

Remarks

Double glazing is mandatory.

Floor should be free of drafts and comfortable to the touch.

Impact noise is critical. Consider acoustic treatment of floor to reduce effects.

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Yes	View In No	Blackout Yes	Privacy No
Daylight Yes	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			0.5		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			77		

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 ϕ for AV equipment			
Other			

Remarks

Notes

Chapter 10
The Music Room

Because of the expectation that tomorrow's adults will enjoy more leisure hours, and because of the current commitment of educators to the development of the whole person, programs in all the creative arts are assuming great importance in the theory of elementary education.

Our selection of music for special treatment in this Report is not intended as a value judgment in which music is given preferential treatment over other forms of art. It is, rather, a response on our part to the very nature of music, to some ways in which music programs differ from programs in other creative arts subjects.

Similarly, our recommendation for a separate music room is not a suggestion that all music be eliminated from the kindergarten and the general learning area. We are merely pointing out that a special environment is required for optimal learning and teaching of music and that the general learning area, in spite of its many other advantages, is ill-adapted to a fully developed music program. The constant production of sound would disturb adjacent learning groups. And because music depends for its effects on silence, the gentle hum of nearby learning groups would certainly disturb the musicians.

Staff shortages in music are persistent, and restrictions of various kinds have forced a large proportion of Metro's elementary school music teachers to concentrate almost exclusively on vocal music.[1] Instrumental instruction has generally been reserved for a few. Now, however, this kind of instruction is being given to more elementary pupils.[2] Now, also, there are more young people taking bachelor's degrees in music.[3] If facilities in elementary schools were adequate, more of these graduates might now find worthwhile careers in these schools.

A Good Music Room—Music and Acoustics[4]

The close relationship between music and space is well described in a report prepared by researchers at Rensselaer Polytechnic Institute:

> *... consider that there is an elastic linkage, of which the room volume is a part, between the originating source and the mechanism of the listener's ear. For instance, the string of a violin produces a vibration which links itself to the sounding box and air volume of the violin itself. In turn, this is linked to the elastic volume of the room, and its vibrations then affect the ear drum of a listener. The wave form which reaches the ear drum, however, is never the wave form which is emitted by the initial source of the sound. . . . The wooden body of a violin, rather than its strings, determines the quality of its sound, even though the origin of sound lies in the vibration of the strings. It is also important to understand that the elastic volume of the air in the room acts simply as an extension of the musical instrument itself, and that a room will have a distinctive character depending on its resonant characteristics and the selective nature of the absorption of sound by the materials of the room.*[5]

Thus, sound received by the listener is the result of the interaction of the vibrations from the source, the characteristics of the instrument, and the characteristics of the room. While changes in any of these will affect what is experienced, only the characteristics of the room will be considered here.

The effect of a room is determined by its *shape*, its *volume*, and the *acoustical* (sound absorptive-reflective) *properties of its surfaces*. These characteristics can be co-ordinated to produce spaces with particular qualities[6] described by musicians as "warmth," "brilliance," "liveness," etc. The most desirable qualities in a music room are probably clarity and uniformity. Clarity or definition is essential if the instructor is to hear each voice and each instrument and if the learner is to hear himself in the midst of the choir or group of players. Similarly, uniformity of sound throughout the room is required if the instructor is to function easily from any part of the room and if no child is to be circumstantially handicapped.

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[1] The Toronto Board's program is the most important exception In 1966-67, woodwinds and brass were provided for pupil use in 45, and stringed instruments in 88, out of a total of 104 K-6 schools (Interview with Jack M Dow, Assistant Director of Music, Toronto Board of Education, July 17, 1967)

[2] "The Suzuki Method, New Hope for Budding String Players," *Montreal Star*, October 1, 1966. See also Clifford A Cook, "Suzuki in Oberlin," *Music Educators Journal* LI (April-May, 1965), 80

[3] In 1967, the University of Toronto had a graduating class in music education of 21 (Interview with a member of the staff of the Department of Music, University of Toronto, July, 1967)

[4] Two useful references are: A Committee of the Music Educators' National Conference, *Music Buildings, Rooms and Equipment* (Washington, D C : Music Educators' National Conference, 1966) and *SER 1 Environmental Evaluations* (Ann Arbor, Mich.: University of Michigan, 1965).

[5] Center for Architectural Research, Rensselaer Polytechnic Institute, *Acoustics and Educational Facilities,* A Report Prepared by the Research Staff of the Center under the Sponsorship of the Division of Educational Facilities Planning, State Education Department, The University of the State of New York (Albany, N Y.. State Education Department, 1966), p. 67.

[6] For a comprehensive summary of room acoustical attributes, see Leslie L. Doelle, *Acoustics in Architectural Design*, An Annotated Bibliography on Architectural Acoustics (Ottawa National Research Council, Division of Building Research, 1965), pp 191-198

Activities and Learnings in the Music Room

The elementary school music room is a place for making music and learning about music. In this room children will sing, move to music, play instruments, read music, create music (in a limited way) and, of course, learn to listen to and understand music. (While the room is not primarily intended as a place for individual or group listening, listening is a necessary part of the other activities.) These specific learning experiences are closely interrelated; generally, several will occur simultaneously. As one expert puts it, "they should not be considered as compartmentalized activities. They should be regarded as complementary approaches to music understanding."[7]

The point of all these activities is to introduce children to music. Through them they will come to understand mood, tone, melody, rhythm, form, and harmony.[8]

No music teacher would deny that music is fun. However, most teachers would also emphasize the goal of increased understanding. An elementary school music program is not a continuous jam session; it is a serious introduction to music. History and theory are integrated into more obvious activities. The objective is to educate youngsters so that they may more fully appreciate, and perhaps add to, our musical heritage.

In addition to its primary function of elementary music education, a well designed music room would be useful to community groups for choral or choir work, instrumental music, rehearsals, and practice for public speaking activities.

General User Requirements

The requirements stated here presume a full-time music teacher, a standard group size of 30 to 35, two hours' instruction time per child per week, and a Grade 1-6[9] enrolment of about 550 pupils. A K-6 enrolment of about 825 (the maximum proposed in Chapter 6) would call for a second teacher and a second room in order to achieve a goal of two hours' instruction per week per child in groups of from 30 to 35, with reasonable working hours for teachers, and within conventional school hours. However, up to about 825 children in Grades 1-6 could be accommodated in groupings of the same size, in only *one* music room, provided that there were *two* music teachers and that the school day was extended.

1. Location

Because instruments will sometimes be taken to the stage of the general purpose room, it would be convenient to locate the music room near the general purpose room. The high-ceiling requirement of the music room may provide a further (non-academic) reason for locating it in that vicinity. Community use suggests placing the music room near the public access to the general purpose area.

2. Size and Shape

The minimum area for an elementary school music room is 1,200 square feet. The room should have a ceiling about 14 feet high. Such measurements provide the necessary space both for choral groups of up to 80 pupils and for creative movement.

The ideal shape for a music room has been much debated. There is some consensus among local music educators that non-parallel walls are desirable. However, Doelle[10] cites instances of rectangular spaces having satisfactory acoustics for music. Whatever decision is made on this point, the shape of the room must satsify two criteria: there must be visual contact between the learner and the instructor, and the room as a whole must be acoustically adequate.

The music room must be an entity in itself. If the space allotted to it becomes insufficient, a second room should be provided. (The first one should not be expanded.) Because we believe that an operable, soundproof, acoustically adequate partition is not presently feasible, and because such a partition would, in any case, drastically alter the acoustical qualities of the room, we suggest that there be no interior space division.

3. Environment

The environmental requirements for the music room relate to its acoustics, climate, lighting, and color effects. Of these, the prime need is for good acoustics. Although we shall be making some specific recommendations concerning wall, ceiling, and floor treatments that are believed to promote good acoustics for music, these suggestions should not be taken as rigid rules. Good acoustics are not produced by any particular type of floor, ceiling, or wall. Rather, they are the result of a successful *combination* of a number of building materials throughout the room.

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[7] Edward J. Hermann, *Supervising Music in the Elementary School* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), p. 72.

[8] *Ibid.*, p. 73.

[9] Kindergarten pupils are not expected to participate in this program.

[10] Doelle, *op. cit.*, p. 199.

Specific User Requirements

1. Floors

A flat, resilient floor surfacing, such as vinyl-asbestos tile, is satisfactory. While sloping floors or permanent risers are useful in some situations, a flat floor is preferred because of the desirability of creative movement. Foldaway risers would be desirable if they did not interfere with the acoustics or casework and if they could be easily manipulated.

2. Walls

Walls serve an essential purpose in the reflection and absorption of sound. No windows are required. Some chalkboard surface is needed at the front of the room. Two six-foot sections (one with permanent music lines and staves) with sliding acoustic covers would be satisfactory. At least an equivalent amount of tackboard is required. A wall-mounted screen suitable for overhead, 16 mm., and 8 mm. projection should be positioned at the front of the room. Speakers for the sound system will also be wall-mounted. Much of the lower wall surface will be required for casework. For convenience, this casework should be concentrated at the sides rather than along the front or rear. Electrical outlets should be provided about every six feet around the room. For achievement of desired acoustical qualities, it is recommended that the proportion and arrangement of absorptive and reflective surfaces be determined by competent specialists. Doors should prevent sound leakage in either direction.

3. Ceiling

According to our music consultants, a ceiling height of about 14 feet is required to give the necessary volume of air. Since the ceiling is as acoustically relevant as the walls, it should be designed to distribute sound uniformly rather than to absorb it. The function of supporting or incorporating lighting fixtures does not lessen the acoustical importance of the ceiling. Two microphones should be ceiling-mounted.

4. Furnishings, Equipment, and Casework

The following lists are intended to be illustrative rather than definitive. Precise requirements for a particular school should be developed from the proposed music program for that school.

The furniture, none of which should be fixed, should include 40 child-size (age six to twelve) tablet arm chairs (ten per cent left-handed) with book storage underneath the seats, 40 child-size (age six to twelve) stacking chairs or stools, six child-size (age six to twelve) stacking flat tables (surface area roughly 36″ x 18″) for Orff instruments, and three adult-size chairs.

The following equipment items are suggested:

(a) 25 adjustable, heavy-duty music stands,
(b) one teacher's music console-lectern (a movable unit incorporating a record player, tape recorder, radio, sound system controls including controls for speakers and microphones on ceiling booms, and a teacher's stand and lectern, complete with lock),
(c) one conductor's stand, stool, and podium (mobile),
(d) one overhead projector and dolly,
(e) one piano, 41″ to 44″ in height, with bench, with lock, and with casters of such a type that the piano can easily be moved by a woman teacher,
(f) one 15-chord Autoharp,
(g) one set of Harmolin bells and mallets,
(h) one set of Orff instruments and appropriate cart with large casters,
(i) one set of wind, string, and percussion instruments (size and proportions of sets to be determined by the program.)

(Other possible equipment includes the music board, electric teaching pianos, electric organs, and other instruments. These or other electronic devices may be desirable in a local situation; some, in a very few years, could even become general requirements.)

Special storage units are required for string, wind, and percussion instruments. Storage of some other equipment items is less essential, but spaces are needed for storage of sheet music, instrumental scores, texts, octavo choral materials, music reference books, recordings, filmstrips, and pictures. (Exact dimensions for satisfactory storage units are available from the Toronto Board of Education.)

Environment

1. Acoustics

The prime environmental requirements are acoustical. Sound from outside the room and extraneous noise (e.g., from temperature-control devices) should be minimized. If possible, they should be eliminated. Similarly, sound produced within the room itself should not be allowed to disturb persons in other areas.

Other than the soundproofing requirements outlined above, the main acoustical need is for each user, regardless of his position in the room, to be able to hear and distinguish clearly among the various sounds made in the room. There should be high definition of sound, high uniformity, and an acceptable or generally pleasing tonal quality. The electronic sound system should be suitable for the room.

2. *Climate Control*

Because the users will sing and may play wind instruments, plenty of oxygen is essential. Temperature and humidity should be comfortable for the human occupants, and they should also contribute to consistent instrumental performance. Because many instruments are very sensitive to minor climatic variations, these fluctuations should be minimized.

3. *Lighting*

Lighting should permit the children to see their music, the chalkboards, the projection screen, and one another without difficulty. Some arrangement for varying the light level is required for the use of audio-visual aids. This is also desirable as an enhancement of the effects of certain types of music.

4. *Color*

Pleasant, bright, fresh colors can help to make the music room a pleasant environment for the pupils and teachers who use it.

Level	Square Feet	Area	Page Number
K-6	1200	Music Room	119

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance	Remarks
Temperature	outside temperature > 90 F°	78°	± 2°	
	< 0 F°	72°	± 2°	
Relative Humidity	outside temperature > 90 F°	50%	± 5%	
	< 0 F°	30%	± 5%	
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2	
	CFM per person	15 to 30	> 8	
Air Changes	per hour	6 to 8	> 5	
Air Movement	velocity: FPM	25 to 40	15 < 50	
Room Pressure	in. WG	+ 0.12	> + 0.05	
Air Filter Efficiency	> 5μ	80%	> 65%	Acoustic privacy
	< 4μ	45% to 80%	—	

Odors Body

Population	max 80	min 10

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	
	Amplifier	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out No	View In No	Blackout Yes	Privacy No
Daylight No	Level Control Yes		

Remarks: If fluorescent lighting is used, consider remote mounted ballasts.

Acoustic Criteria

Ambient Noise Level: NC 30 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max	0.8	0.8	0.8	0.8	0.8
	min	0.8	0.6	0.5	0.5	0.5
Generated Noise Level (in db re .0002 dynes/cm^2)	Frequency: cps	31.5	125	500	2000	8000
	design level	82	94	96	102	90

Remarks: See notes.

Services

Mechanical Services

CW Yes	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1ϕ for AV equipment			
Other Master console for recording & play back			

Notes

Music Buildings, Rooms and Equipment, Library of Congress Catalog Number 55-3617.

Music Acoustics and Architecture, Leo L. Baranek, John Wiley and Sons Inc., New York 1960.

50% to 70% of ceiling should be sound-absorbing and 50% of any 2 adjacent walls should have "deep" sound absorbing treatment. Consider sound-absorbing cabinet doors.

30% to 50% sound reflecting area should be located near the centre of the room and some splaying or other sound diffusing treatment is desirable. Parallel walls should be avoided.

Storage requirements are very specific and must be checked carefully.

Chapter 11
The General Purpose Area

Physical training has long been regarded as an essential aspect of human development. Often such training was done solely to ensure an adequate supply of proficient warriors. In Europe, certain schools, called gymnasia, were long ago set up to develop the mind as well as the body through instruction and exercise. In some countries, patterned physical movement has become a major art form.

In relation to what has been done in Scandinavia, in Australia, and even in the United States, physical training in Canada has generally been underemphasized. The desirability of "a sound mind in a sound body" has been acknowledged here in voice and in print, but the time allotments and facilities required for physical education have often been lacking. Scarcity of facilities has been most severe at the elementary level of public education.

Only recently have K-6 schools in Metropolitan Toronto been provided with at least one general purpose room. Such rooms are intended to accommodate large groups for musical activities or instruction, for film viewing or for special events, as well as for the indoor physical education program. For such multi-functional use, most of today's general purpose rooms are inadequate–usually because they are too small and have other limitations as well.

Limitations of Existing Facilities

For many years, physical education and health have been allotted ten per cent of pupil time in the elementary school curriculum.[1] Today, many physical education specialists claim that physical education alone requires a ten per cent emphasis–or, in other words, a minimum time allotment of one half-hour per child per day. While class size of 30 to 35 children and one teacher[2] is satisfactory to most physical education specialists, the time allotment is not.

Current procedures and one general purpose room in a 15-classroom school do not allow each child to receive a half-hour of physical education every day. Some simple calculations show that only three periods a week are possible in a 17-room school, only two per week in a 23-room school. Even with two general purpose rooms in a 23-room school, only four periods per child per week are possible. These rough estimates take no account of scheduling realities such as recess, lunch periods, staff breaks, or preparation time. Furthermore, they are based on the assumption that the general purpose room is used exclusively for physical education.

Obviously, existing provisions are insufficient for optimal physical education in elementary schools. A full physical education program requires either much more space than is presently available or a drastic modification of school organization (involving double shifts, extra staff, etc.). This latter alternative, though generally abhorred, must be considered if additional space is not provided.

The insufficiency of the general purpose room for physical education alone indicates the futility of regarding this space as being readily available for large-group instruction or other purposes.

In addition, most general purpose rooms have two other serious limitations. First, according to our music consultants, these rooms are acoustically inadequate for music instruction. Physical education and music education have unique environmental requirements which necessarily conflict. For example, physical education requires smooth rigid walls, while music education requires walls which are, in part, not smooth. Second, most existing general purpose rooms have a stage area which is often idle. This waste of space cannot be justified in view of current educational costs and needs.

Emerging Trends in Physical Education

Physical education is developing rapidly. Current trends call for expanded and improved facilities.

The people responsible for the new ideas about physical education are a new breed of specialists. They are replacing both the drill-instructor type of physical education teacher and the generalist elementary teacher who is often ill-prepared for and/or uninterested in physical education. The new physical education specialists have ideas about what physical education is, who should conduct and receive it, where it should occur, and how it should be conducted.[3]

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[1] Ontario Department of Education, *Programme of Studies for Grades 1 to 6 of the Public and Separate Schools*, 1960, p. 14

[2] "Recommendations for Physical and Health Education Facilities in School Programmes" (A Committee of the Metropolitan Toronto Association of Supervisors of Physical Education [a branch of the Canadian Association for Physical and Health Education], 1967), Indoor Area, Section III, Subsection 2 (Photocopied.) Cited hereafter as Recommendations for Physical and Health Education Facilities.

[3] Maryhelen Vannier and Mildred Foster, *Teaching Physical Education in Elementary Schools* (Philadelphia W.B.Saunders Company, 1963)

Traditionally, physical education was focused intensively on body development. Exercise was the key. (Health, the related subject, emphasized hygiene, nutrition, and habits of clean living.) The model products of this type of physical education program were the athlete and the school team. Many children were relegated to spectator roles. Curricular physical education classes often served mainly as screening sessions for extramural competitive programs. In K-6 schools which lacked a physical education specialist or a "keen" staff member, the physical education program was a token affair.

The new specialists, however, emphasize universal participation. They proclaim an interest in the total personal and social development of all children—not merely in the well co-ordinated bodies of a few. They propose physical education as a vital activity within the total curriculum, one which can assist in the integration of the arts and sciences. Physical education, from this standpoint, offers each child experiences from which he may gain personal meaning for basic concepts such as self, space, and movement.

This ideal of physical education cannot be achieved in the minimal facilities which have characterized the elementary school. It demands greatly extended facilities. Swimming pools, field houses, extensive audio-visual equipment, natural outdoor areas, not to mention change rooms, shower rooms, and staff preparation rooms, will be required.

At this point, most people stop listening because they believe these things to be financially unattainable. But the new physical education specialists are quick to point out that ingenuity can often be substituted for dollars. Commercially available pools can be located at ground level and out-of-doors quite economically. To extend their period of usefulness, they can be covered by air-supported plastic or similar lightweight structures.[4] The field house can be partially or completely composed of a plastic-enclosed tarmac area immediately adjacent to the school. With special suits for the children, the area could be used without artificial heating in all but the coldest weather. The natural outdoor area (for "orienteering") could be developed with (or by) conservation authorities. Here physical education could be combined with nature study or science.[5] Some of the most useful audio-visual devices, such as 8 mm. loop film projectors, are relatively inexpensive and are becoming increasingly available. The shortage of well-trained teachers will probably be relieved when there are good facilities to attract them.

This brief discussion is offered as a basis for the following statement of user requirements for an elementary school general purpose area. While this space is the key facility for the physical education program, it can (or should) never be regarded as sufficient for a fully developed program of physical education. Similarly, while the space is still labelled "general purpose area," it is regarded *primarily* as a physical education facility (a gymnasium) and only secondarily as a large-group area for children or adults.

Users and their Characteristics

The prime users of this space are, of course, elementary school children of both sexes who range in age from five to about twelve years. These children will use the facility primarily as participants in the school physical education program and secondarily as members of clubs such as cubs, scouts, brownies, or guides.

These children are extremely diverse in size, strength, agility, and attitude. They range from the athletically incompetent, the awkward—even the physically handicapped—to the active, well developed, well co-ordinated individual. While this variability exists at every age level, the older children will generally be better co-ordinated, have more stamina, and take a more active role in group sports. Accordingly, older children can be expected to participate more strenuously and for longer periods in the activities of a physical education program.

The teachers are the second set of prime users. Since the general purpose area is their work area, it should be designed and equipped to facilitate their work.

Some community use may be made of the elementary school general purpose area both by neighborhood teen-agers, probably in a community recreation program, and by adults, probably for social or recreational purposes.

Specific Objectives

The specific objectives of physical education in elementary schools parallel the general aims of public education discussed in Chapter 1.

1. Self-development

Self-development, in the widest sense of the word, is the first objective of the elementary school program. Physical development includes the cultivation of specific skills (running, jumping, etc.) in a wide range of body movements. The desired consequences of practising skills (regular exercises) are strength, endurance, co-ordination, a sense of balance, and a general condition of fitness. Specific kinds of character development are also objectives of physical education. The regime is designed to promote emotional control, initiative, enjoyment of physical movement, self-confidence, and self-acceptance. Ideally, physical and character development are integrated in such a way as to contribute to the self-fulfillment of the whole person.

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[4] Educational Facilities Laboratories, *Air Structures for School Sports* (New York: EFL Inc., 1964).

[5] See pp. 168-69 for a fuller statement on outdoor education.

2. Development of Social Skills

In contrast with the child-centredness of the self-development objective, the second set of physical education objectives is society-centred. Pupils are expected to learn to live, work, and play with others through sharing equipment, co-operating in team situations, acquiring a tolerance and appreciation for the attitudes and efforts of others, and through giving and accepting leadership.

3. Acquisition of Knowledge

The third set of physical education objectives concerns the acquisition of knowledge. Physical education is designed to teach principles. These are physical principles such as space, movement, and leverage; biological principles such as development, respiration, and circulation; social principles such as communication, leadership, and game strategy; and psychological principles such as perception, attitude, and motivation. It is an objective of physical education to give the students personal and practical, as well as theoretical, meanings for these concepts.

Activities to be Accommodated in the General Purpose Area

While the specific objectives of physical education are varied, they are nonetheless interrelated and clearly in harmony with overall objectives of education which appear to find wide acceptance in our society. Such a wide range of objectives can be attained only through a full program of diverse activities and the co-ordinated efforts of the school staff.

1. Curricular Activities

The physical education program is composed of two sequences of activities. The pattern of activities in each half-hour period is a sequence at one level. The order of activities through a school year is at another level. Within the major categories of activity, component skills are ordered in progressions according to complexity or difficulty.

A specific physical education period will generally include warm-up activity, big-muscle exercise, skill development, and some sort of game.[6] Many activities will involve the use of small apparatus. The main portion of each lesson will generally be the acquisition of a specific new skill. The game at the end of the period often makes use of this skill and thus provides additional practice.

The sequence of activities throughout the year will be determined by climate, by the amount and diversity of apparatus, and by custom. Warm-up and big-muscle activities are basic and will form a part of every physical education period throughout the year.[7] Some of these require apparatus.

Because the whole body must be used and co-ordinated in tumbling, this activity forms a part of most indoor physical education programs. The unique integrating advantages of tumbling clearly outweigh the instructional problems it presents and the extra safety precautions it requires.

Running, jumping, soccer, volleyball, and softball are suitable for the playground, although many of the component skills are easily taught and practised indoors. (Volleyball is also, of course, well adapted to the general purpose area.) Furthermore, a great many games involving the use of the volleyball have been developed for indoors. These diverse ball games involve varying numbers of participants (from two to thirty-five) in many different formations (circles, scatter,[8] etc.). The criterion of game selection is active participation.

Rhythmics is the final major category of the physical education activities which take place in the general purpose room. Folk and creative dances enable the children to experience the joy of free and patterned movement and, at the same time, to develop general grace and skills which will persist throughout their lives.

Swimming and ice-skating may also be part of an elementary school physical education program. But they do not, of course, take place in the general purpose room.

2. Non-Curricular Activities

Any or all of the curricular activities already mentioned can take place out of regular school hours. Games are likely to form a major part of any club program. In addition to physical games, the general purpose room will probably accommodate crafts, films, meetings, and children's commercial table-top games.

[6] Ontario Department of Education, *Physical Education Junior Division*, Curriculum J 5 (Toronto: Ontario Department of Education, 1959), p. 14

[7] *Ibid.*, p. 13.

[8] *Ibid.*, pp. 15-18.

Where teens or adults are expected to use the room for recreation, the activities might include badminton, table tennis, golf practice, chess, cards, drama, and popular dancing. The activities of adult political clubs, Home and School groups, ratepayers' associations, and other community groups must also be accommodated in the general purpose room.

General User Requirements

Early, continuous, and serious consultation between educators and architects is mandatory if the design of the general purpose room is to fulfil its many specialized functions. Three of the more general factors to be considered in such consultation are discussed in this section.

1. Location

The general purpose area should be located so that it can be used conveniently and yet contribute minimal noise to other areas. All school pupils will use this area several times a week. (Ideally they will use it daily.) The area should therefore be easily accessible from all parts of the school. Because of the steady and heavy traffic flow generated by this area, however, its interior entrances should not coincide with other points of heavy traffic.

To ease movement of children and equipment to and from the change rooms, the general purpose area should also be conveniently accessible from the playground. To facilitate community use, it should have an entrance convenient to parking areas. Also, its design should allow it to be used independently of the rest of the school, and its public entrance (vestibule) should be large enough for storage of winter footwear and outer clothing. Finally, its location should eliminate regular traffic across the gymnasium floor by persons wearing street shoes.

The general purpose area must, of course, be acoustically separated from quieter parts of the building such as the library materials centre and the general learning areas.[9]

2. Space

The general purpose area should have sufficient space for the planned program of activities. Its dimensions and space arrangements should be derived from anticipated educational and community uses. Provision for expansion should be built into the design.

To this point, the general purpose area has been referred to as if it were a single enclosed room (which it often is in older schools). Actually, it should consist of several distinct spaces. The largest and functionally most central space is the general purpose room itself. This room is, in fact, a gymnasium (or a double gymnasium if the school enrolment is sufficient). The other parts of the general purpose area include athletic and community storage, dressing rooms, chair and stage storage,[10] and possibly a kitchen and/or servery. The area required in a school with enrolment of about 550 would be approximately 3,625 square feet, divided as follows:

Gymnasium[11]	2,500 sq. ft.
Athletic and community storage	450 sq. ft.
Dressing rooms, 2 at 200 square feet	400 sq. ft.
Chair and stage storage	200 sq. ft.
Kitchen-servery	75 sq. ft.
Total	3,625 sq. ft.

To accommodate about 825 children, the area would need a second gymnasium (2,000 square feet), extra storage space (200 square feet), and extra dressing rooms (400 square feet). Detailed requirements for each part of the area are presented later in this Chapter.

3. Environment

The climate and equipment of the area should be suitable for continuous, diversified, and often strenuous physical activities.

This will never be a quiet area. Nevertheless, it should not become a receptacle for all the unwanted sound in the building. The general purpose room is an instructional space, and some attempts to modify or control the sound produced within the area are appropriate. Efforts to prevent the spread of noise to other areas can also contribute to noise control within the area itself.

Natural light is inadequate in this area. Artificial light is required to give uniform, glare-free and shadow-free illumination throughout the space. Control of glare and shadow are especially important because of the need in many games for instantaneous, accurate visual perception.

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[9] Recommendations for Physical and Health Education Facilities, Indoor Area, sec. 1, 1.

[10] While traditional general purpose rooms had large built-in stages, much current opinion holds that these are unnecessary. What is desired is a stage which can assume a variety of sizes (accommodating up to a maximum of 100 children), shapes, and positions in the room and which is readily demountable for storage.

[11] Ontario Department of Education, *School Business Procedures*, Section 2, Instructions for the calculation of approved cost for legislative grants toward the capital cost of work in connection with school buildings, pp. 2A/11 and 2A/12, indicate that the minimum space allotment, exclusive of permanent stage, shall be 2,500 sq. ft. for a school with enrolment 551, pupil places 522. However, the Recommendations for Physical and Health Education Facilities state: "The minimum size should be fifty feet by forty feet excluding stage and equipment rooms." (Indoor Area, Sec. 1, 2.) Thus, to obtain provincial grants the area must be 500 square feet larger than that defined as minimal by our committee of users.

Temperature, humidity, oxygen content (air change), and odor must be controlled. A constantly comfortable environment must be provided for energetic activity. The dull, stuffy, even dismal tone of the old-time gym is not appropriate for physical education nor for elementary school children.
The atmosphere of the area should be fresh, vigorous, and lively.

Regulation physical education equipment—balls, wands, mats, benches, etc.—must be supplied and conveniently stored. Certain equipment such as sockets for standards, anchors for climbing ropes, and foldaway basketball boards must be designed into the building. Here again, collaboration between architect and educator is indicated.

Most of the currently available instructional aids have a place in physical education. Especially useful are 16 mm. films, 8 mm. loop films, overhead projectors, and appropriate screens. Sound equipment for public address and music is essential. Eventually, videotape recorder and playback equipment may become equally essential to physical education.

All equipment must have storage that does not interfere with or restrict the use of the gym floor or walls.

Specific User Requirements for the Main Room (Gymnasium)[12]

In addition to the general requirements of location, space, and environment, there are other more specific ones, which are related to (1) floor, (2) ceiling, (3) walls, (4) doors, (5) windows, (6) furnishings and equipment, and (7) environmental control.

1. Floor

The floor of the gymnasium is heavily used and should meet rigorous specifications. It must, of course, be smooth, level, resilient, warm, and durable. While hardwood floors have long been preferred,[13] any material which can give the desired performance would be academically satisfactory. The finish should have a light-reflection factor of 30 to 40 per cent.[14] Sleeve-type sockets, of proper size for the various standards, should be set in the concrete base and be flush with the finished floor. Placement must be determined in consultation with a physical education specialist. Game lines should be kept to a minimum and be durable. The following game lines are suggested:

(a) a one-inch black boundary line, three feet from the wall, around the room,
(b) a one-inch black line across the floor dividing the floor area in half,
(c) a one-half inch red line, as a twelve-foot radius circle, centred on the floor.[15]

Other lines will likely be added according to local preferences and programs.

2. Ceiling

The minimum clear height in the gymnasium should be 18 feet. Anchors for climbing ropes should be at least six feet from a wall and not more than five feet apart. These anchors should be securely fixed to the roof structure and capable of supporting swinging apparatus.[16] Ceilings might be shaped or treated to reduce reverberation (echoes) and should have a light-reflection factor of 85 per cent.[17]

3. Walls

Walls are used for ball work, target practice, and support of apparatus. Accordingly, they should be rigid, smooth, straight, and clear to a height of 14 feet. Their surfaces should be non-glare.[18]
For example, concrete block walls with a washable protective coating are satisfactory; plaster, tile, wallboard, and wood paneling are not. Upper walls should have a light-reflection factor of 65 per cent, while lower walls may range from 40 to 60 per cent.[19] All corners around doorways and alcoves should be rounded for safety.

4. Doors

The number, location, and types of exits must meet the local fire regulations. Double doors or rollaway doors with a width of seven feet are appropriate for equipment rooms and for the opening to the playground.[20] These doors should be solid and lockable. For safety reasons, doors should be free of projecting hardware.

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[12] These requirements apply to the second gymnasium as well as to the first The second gymnasium must adjoin the first and be separated from it by a folding door Provision for a second gymnasium would invariably seem in order whenever new schools are built for enrolments of more than 600 With conventional scheduling and hours, the first gymnasium allows three half-hour periods per child per week only up to about 500 pupil users

[13] Recommendations for Physical and Health Education Facilities, Indoor Area, sec. 1, 3, and Appendix I

[14] Ontario Department of Education, *Suggestions for Physical Education Facilities in Ontario Secondary Schools* (Toronto Ontario Department of Education, 1966), p. 5

[15] Recommendations for Physical and Health Education Facilities, Indoor Area, sec. 1, 5

[16] Recommendations for Physical and Health Education Facilities, Indoor Area, sec. 1, 11

[17] Ontario Department of Education, *op. cit.*, p. 5.

[18] Recommendations for Physical and Health Education Facilities, Indoor Area, sec 1, 12.

[19] Ontario Department of Education, *op. cit.*, p 5

The folding door in a double gym should be solid, durable (wood is desirable), and completely recessed when open. The door should provide complete physical and maximum possible acoustical separation of the two gyms. Because many doors supported by floor-track have not been satisfactory, ceiling mounting is suggested.[21]

Provision for manual operation of electrically operated doors is recommended. A pass door in the folding door is desirable. The design should allow proper functioning (or adjustment) of the large folding door in the event of roof deflection or building settlement.

5. *Windows*

Windows are academically unnecessary in the general purpose area. If windows are provided, they should be in metal sash, at least fourteen feet above the floor, and durable (armor glazed or screened). Their location should minimize direct sunlight and glare. The design of valance boxes or sills should prevent the lodging of balls or bean bags. Even where cross-ventilation is possible from mechanically operated windows along the top of sidewalls, this should not be regarded as adequate provision for air change. Heat loss, condensation, and breakage problems should also be considered.[22]

6. *Furnishings and Equipment*[23]

a. *Permanent physical education equipment*

Most physical education teachers have equipment preferences and should be consulted when equipment is being selected.

The following list is offered as an illustrative check list for facility design teams. It is not intended to be definitive. Permanent physical education equipment for the general purpose room should include tumbling mats (five by eight feet), balance benches, volleyball standards and nets, jumping standards, and climbing frames (inclined boards, beams, ladders, poles, horizontal bars, scrambling nets, and ropes). A record player could also be classified as permanent physical education equipment.

b. *Other permanent equipment*

The general purpose area also requires a clock and a public address system (two microphones, strategically located outlets). A 16 mm. sound projector with connection to the sound system, an appropriate projection screen, an overhead projector, a combination filmstrip and slide projector, a combination chalkboard and tackboard, special lighting equipment for stage use, stacking chairs, and a sectional demountable stage are suggested as desirable equipment.

A lockable recessed space is desirable for the sound equipment and for a piano, if one is deemed necessary.

The surface area of each chalkboard and tackboard should be four feet by four feet. These should be unbreakable and located three feet above the floor where they will not interfere with games or future installations. For safety, the chalk and brush tray should be recessed and the board itself should be flush with the wall.

Carts should be provided for the stacking chairs so that they can be easily moved and stored. A storage cart would also be desirable for the audio-visual instructional aids. Generally, children will not move the carts.

The sectional stage must be easily demounted and stored. It should be possible to make the stage into various sizes and shapes and to locate it at any point on the floor of the room. Storage carts for components might facilitate the use of this new type of stage.

c. *Expendable equipment*

The reader is reminded of the availability of equipment lists from physical education specialists and of the fact that the list reproduced here is for illustrative purposes only. Following is the list of equipment suggested by the Ontario Department of Education for grades 4, 5 and 6:[24]

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[20] Recommendations for Physical and Health Education Facilities, Indoor Area, sec. 1, 17.

[21] *Ibid.*, sec. 2, 8. See also Ontario Department of Education, *op. cit.*, p. 6.

[22] Recommendations for Physical and Health Education Facilities, Indoor Area, Sec. 1, 6.

[23] Ontario Department of Education, *op. cit.* A list of basic reference books is offered on pp. 28-29 of this publication. See also the Athletic Institute and American Association for Health, Physical Education & Recreation, *Equipment and Supplies for Athletics, Physical Education & Recreation*, by Participants in National Conference, The Athletic Institute, Chicago, Illinois, 1960, pp. 7-8.

[24] Ontario Department of Education, *Physical Education Junior Division, Curriculum J.5.* (Toronto: Ontario Department of Education, 1959), p. 22.

40 small balls (sponge or inflated)
40 skipping ropes (9′–10′ long, $\frac{3}{8}$″ sash cord)
40 bean bags (5″ square)
1 doz. hoops (36″ diameter; cane, plastic, or rattan)
1 doz. utility balls (5″ or 6″ inflatable)
1 doz. utility balls (7″ or 8″ inflatable)
1 doz. wands (various lengths)
1 doz. softballs (rubberized)
1 doz. softballs (soft)
1 doz. batons
1 doz. bowling pins, Indian clubs
8 softball bats (junior size)
4 soccer balls (rubberized)
4 volleyballs (rubberized)

A supply of records for folk dancing and some percussion instruments are also required.

Storage for all physical education equipment and furnishings must be provided off the gymnasium floor and outside of the gymnasium walls.
The gymnasium itself must remain an empty cube of enclosed space.

The equipment suggested above is intended only for instruction in physical education, not for recreational use at recess or lunch periods. Recreational equipment should not be stored with instructional materials.

7. Environmental Control

a. Acoustical
Disruptive noise and echoes should be controlled. Acoustical treatment of wall surfaces should not interfere with the wall uses previously specified. Unnecessary noise from heating and ventilating equipment should be controlled.

b. Temperature, humidity and air change
The temperature of the whole area should be comfortable 12 months of the year, regardless of the nature of the activities. But heating-cooling equipment should not interfere with the program. For example, radiant heating from floor and/or ceiling is ideal in that it is silent and requires no equipment on the floor or below the 14-foot level on the walls.

A forced air circulation is required which will control dust, odor, and humidity and provide plenty of oxygen. The relative humidity should be held within a comfortable range. The climate of the general purpose area must be controlled independently of the rest of the building. All thermostats or other control devices should be recessed into the wall and guarded.

c. Lighting and switching
The whole floor area should be well lighted; glare and shadow should be minimized. All fixtures and exit lights should be recessed and guarded to resist buffeting by balls. The fixtures should be easily relamped and maintained. Reflection factors recommended by the Ontario Department of Education and mentioned previously are summarized here:

Ceiling	85 per cent
Upper walls	65 per cent
Lower walls	40–60 per cent
Floor	30–40 per cent.

A lighting engineer should be consulted regarding provision of special lighting for the proposed flexible stage.

All electrical outlets, switches, and PA outlets should be recessed and have sturdy cover plates. The electrical outlet for the clock must be away from installations for basketball and similar purposes. Another outlet is required in the sound equipment alcove. Still other electrical outlets and microphone outlets should be conveniently spaced around the walls, six to twelve inches from the floor. The PA speaker boxes, clock, bells, horns, and fire alarm should be recessed if located within 14 feet of the floor. In any event, they must be properly protected from balls.

The control panel (switch box) should have fully labelled switches and permit individual or banked control. Provision for dimming should be considered (for film and drama). The control panel should, of course, be recessed, properly guarded, and located near a corner (away from the chalkboards and tackboards). One houselight switch is required at the main entrance. Emergency lighting must also be provided.

d. Color
Reflection factors have already been summarized in our discussion of lighting. In general, light, bright colors are preferred.

Auxiliary Spaces

Physical education calls for many other facilities in addition to a gymnasium. These include (1) storage areas, (2) change rooms, (3) kitchen, (4) playground, and (5) outdoor off-site facilities.

1. Storage Areas

Storage spaces are required for outdoor equipment, indoor equipment and supplies, community group materials, sound equipment, chairs, and stage components. Descriptive lists of items to be stored were presented under the heading "Furnishings and Equipment."[25]

[25] See pp 126-27.

About 450 square feet of storage would be required for outdoor and indoor athletic equipment and community group materials in a 550-pupil school and about 650 square feet in an 825-pupil school. While these three storage spaces could be adjoining, they should be individually securable. Possibly these spaces could all be located in one large room subdivided by heavy demountable screens.

Markers, hurdles, starting blocks, baseball equipment, and other outdoor equipment require storage space that opens directly to the playground. Access to the outside should be at ground level or via a ramp. The door for this exterior opening should be securable to prevent pilfering.

Storage space for indoor equipment and supplies in daily use such as balls, nets, records, and sashes should open directly to the gymnasium. (See requirements for doors.) Flexible casework (shelving, bins, and cupboards) is required for the numerous items—balls, standards, etc. Floor space must be allowed for mat carts and heavy apparatus. Ducts, pipes, and heating equipment should not be allowed to usurp the intended storage function of these spaces.

Storage space for use of community groups should be similar to that described for indoor equipment.

It should be possible to control sound equipment from within the gymnasium. Some audio-visual equipment, such as overhead and 8 mm. projectors, will be brought into the gymnasium for use. It would seem best to store such fragile items in a securable alcove off the gymnasium.

A separate storage space of about 200 square feet is required for chairs and stage components. This space should also open directly into the gymnasium. (See requirements for doors.)

2. *Change Rooms*

Two change rooms (one each for boys and girls) of about 200 square feet are required for a 550-pupil school. A second set of rooms will be needed where the second gymnasium is provided (at about 825 enrolment).

The change rooms should have easy access to the gymnasium, the playground, and the rest of the building. To reach the change rooms from the playground or the rest of the building, students should not have to cross the gymnasium floor. The entrances to the change rooms should be screened. Steps at the entrances are not desirable.

The rooms should have no sharp corners or projections. There should be moisture-resistant walls and a "non-slip" floor sloping to a drain. If at all possible, some shower facilities should be provided.[26] Basic toilet facilities are mandatory. A urinal, a toilet, and a wash basin are required in the boys' change room; two toilets and a wash basin are required in the girls'.

The area has no special lighting requirements. The fixtures should be protected. A key-type light switch is preferred.

A warm temperature should be maintained to prevent chilling. If there are showers, the exhaust system should be capable of removing large amounts of atmospheric moisture and of keeping the floors reasonably dry.

Short hooks for clothing should be placed at appropriate heights and intervals. Fixed benches may be attached to the walls at convenient heights from the floor.

A clock, a steel mirror (away from the basin), a drinking fountain, and a three-by-four-foot wall-mounted tackboard complete the furnishings.

3. *Kitchen*

If a separate kitchen is planned, it should be small (about 75 square feet) and functionally designed. It should contain a stove, a sink, a refrigerator, and appropriate counter and shelf space. If possible, this kitchen should be available for staff and pupil use as well as for the use of community groups. Several hundred people might be served beverages and cookies or even a light lunch from this facility.

4. *Playground*

Outdoor facilities are closely integrated with the general purpose area in the physical education program. These facilities are considered in Chapter 14 under the heading of *Grounds*.

5. *Outdoor Off-site Facilities*

The general purpose area is the key provision for physical education. However, it cannot, in itself, meet the requirements of those who hold advanced conceptions of physical education.

Physical education specialists claim that large natural outdoor areas are required to provide the

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[26] Ontario Department of Education, *School Business Procedures,* (p. 2A/12). Change rooms with showers are now eligible for grants in K-8 schools of 420 or more enrolment, but no allowance is presently made for showers in K-6 schools with the same enrolment.

experience of movement in large spaces.
These specialists refer to this activity as *orienteering* and regard it as an essential part of physical education. Conservation authorities also maintain that it is vital for youngsters to become familiar with natural outdoor areas. They wish children to learn the proper use of natural resources so that they may enjoy their leisure time as children, adolescents, and adults without destroying the beauty of the natural environment. Science teachers also stress outdoor education. They say that it is important to expose pupils to native flora and fauna in their natural habitat. It is their belief that this direct experience is crucial to children's understanding and appreciation of nature and of scientific principles.

It is inconceivable, of course, for each elementary school in Metro to be provided with a large acreage of natural terrain. Yet large natural outdoor areas are required for the full achievement of the goals of physical education. Outdoor education has been advocated for many years; the principles are generally accepted.[27] Obviously, the required facilities must be provided off-site.

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[27] M L.Van Vliet, *Physical Education in Canada* (Scarborough, Ont Prentice-Hall, Inc., 1965), pp. 207-10

Level	Square Feet	Area	Page Number
K-6	2500 to 4500	G.P. (Gymnasium)	131

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature outside temperature	> 90 F°	80°	± 2°
	< 0 F°	67°	± 2°
Relative Humidity outside temperature	> 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2
	CFM per person	30 to 40	> 20
Air Changes	per hour	6-8	> 2
Air Movement	velocity: FPM	25 to 40	± 10
Room Pressure	in. WG	0.00	± 0.05
Air Filter Efficiency	> 5μ	80%	> 65%
	< 4μ	45% to 80%	—

Odors Body			
Population	max 80	min 20	
Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	Projector	—	
	Amplifier	—	

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 50
View Out No	View In No	Blackout Yes	Privacy No
Daylight No	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 45 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.5		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	58	77	89	75	60

Remarks

Light sources must be well shielded because of acute viewing angles.

Impact noises severe.
Do not place occupied spaces beneath gymnasium, except locker, shower, or washrooms.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1ϕ for AV equipment			
Other			

Remarks

Speaker system must be designed for use with portable amplifier.

Notes

Adequate protection must be provided for mechanical and electrical equipment and lighting fixtures.

Avoid sharp corners and projections.

Do not install drinking fountains within the room.

Level	Square Feet	Area	Page Number
K-6	2500 to 4500	G.P. (Auditorium)	133

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	80°	± 2°
	outside temperature < 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	outside temperature < 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2
	CFM per person	15 to 40	> 8
Air Changes	per hour	6 to 8	> 2
Air Movement	velocity: FPM	25 to 40	20 < 50
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—

Odors Body, Smoke (community use)

Population	max 8 sq ft/person	min N/A

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	Projector	—	
	Amplifier	—	
	Stage Lights	—	

Remarks

Sep. temperature control for community use

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 30
View Out No	View In No	Blackout Yes	Privacy No
Daylight No	Level Control Yes		

Area lighting to be controlled from stage area

Acoustic Criteria

Ambient Noise Level: NC 30 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max		1.6	1.4	1.4	
	min		1.4	1.0	1.0	

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	75	87	89	95	83

Avoid vaulted or domed ceilings.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Consider smoke exhaust	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 ϕ for AV equipment			
Other			

Remarks

Notes

Consider specific mid-floor power and signal outlets for projectors and microphones.

Speaker system should be designed for use with portable amplifier.

Stage lighting system is desirable.

Level K-6	Square Feet 200 to 400	Area Dressing Room	Page Number 135

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	80°	± 2°
	outside temperature < 0 F°	75°	± 2°
Relative Humidity	outside temperature > 90 F°	50°	± 10°
	outside temperature < 0 F°	30°	± 10°
Outside Air	CFM per sq ft	0.5	> 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25	± 10
Room Pressure	in. WG	− 0.05	0.00 < − 0.10
Air Filter Efficiency	> 5μ	N/A	N/A
	< 4μ	N/A	N/A

Odors Body, clothing

Population	max 70	min 0	
Heat Gain	source Lighting	watts 1 to 2/sq ft	BTUH

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 30
View Out No	View In No	Blackout No	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 45 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm^2)	Frequency: cps	31.5	125	500	2000	8000
	design level	52	71	83	69	54

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain Yes	Exhaust Sanitary	
Other			

Electrical Services

PA Yes	Intercom No	Handset No	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V–1 ϕ for cleaning equipment			
Other			

Remarks

Notes

Lighting fixtures and other equipment should be well protected.

Avoid the use of glass.

Level K-6	Square Feet 60 to 100	Area Kitchenette	Page Number 137

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	outside temperature < 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	outside temperature < 0 F°	30%	± 5%
Outside Air	CFM per sq ft	> 2	—
	CFM per person	N/A	N/A
Air Changes	per hour	12 to 20	—
Air Movement	velocity: FPM	N/A	N/A
Room Pressure	in. WG	− 0.15	< − 0.10
Air Filter Efficiency	> 5μ	N/A	N/A
	< 4μ	N/A	N/A

Odors Cooking, smoke

Population	max N/A	min N/A	
Heat Gain	source	watts	BTUH
	Lighting	1 to 3/sq ft	
	Cooking	—	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) N/A			Ft Candles 50
View Out Op'l	View In No	Blackout No	Privacy No
Daylight Op'l	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 40 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		
Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			varies		

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas Op'l
Air No	Drain Op'l	Exhaust Yes, consider grease filter	
Other			

Electrical Services

PA No	Intercom No	Handset No	Bell Tel Op'l
Program System Op'l		Clock System Op'l	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V–1 φ & 220V–1 φ if required for stove			
Other			

Remarks

Notes

Combined use by both community and staff should be planned for, if possible.

Chapter 12
The Library Materials Centre

During the last decade the concept of expanding and improving school libraries has been accepted. There is, however, a wide gap between the acceptance of an idea and its practical implementation.

At the elementary (K-6) school level, library space allotments have been quite small. A converted classroom or an area of 1,000 to 1,200 square feet is considered generous. In many schools libraries, furniture and equipment have been meagre. The size of the book collection is often insufficient, and non-print material has often been non-existent. School library hours have not been flexible. Evening and weekend use by students, to say nothing of the community, has rarely been considered. Professionally trained school librarians are in short supply, and they have sometimes been misused or overworked.

Recently, many educators have firmly predicted that, as a minimum, the library materials centre at any one time should be able to accommodate and serve the learning needs of at least 30 per cent of the pupils in a school.[1] At present, we consider ourselves fortunate if our libraries can accommodate about 5 per cent of the enrolment. Obviously, drastic improvements are indicated if we are serious about providing optimal library facilities for every child.

There are two basic reasons for supplementing and improving library services—the problem of accommodating the emerging trends outlined in this Report and the problem of the information explosion. The breaking down of grade barriers and of the traditional one-teacher-one-class concept, and the emphasis on individual differences and constant regrouping of pupils have major implications for the elementary school library. The increasing volume of information in all forms actually facilitates the implementation of these trends. Today, no one teacher and no one book or collection of books is sufficient. For many subjects, newspapers, magazines, films, tapes, radio, or television are more adequate than books. It is for this reason that we have chosen the name Library Materials Centre for the area in which all types of information are stored and used.

The library materials centre can become the school's centre for enrichment and information. Here materials in many different forms will be utilized in an organized way under the direction and guidance of professionally trained personnel.

Factors Relevant to the Design of the Library Materials Centre

From the educator's viewpoint, at least seven predominant factors should be considered when designing a library materials centre. These include (1) location, (2) future expansion, (3) space, (4) environment, (5) aesthetics, (6) technology, and (7) the need for prior consultation.

1. Location

The library materials centre should be so located that its learning atmosphere will not be disrupted by outside noises coming from sources such as heavy vehicular or aircraft traffic, playgrounds, or industry, or by inside noises from music rooms, gymnasia, or kindergartens. Unless it has full climate control, the centre should face north to avoid extreme variations of temperature and lighting. It should be easily accessible from all the instructional areas of the school. This does not mean that it should be a "walk-through" area, but rather that some of its perimeter should be very close to the main flow of pupils. To encourage maximum community use, the library materials centre should be located at ground level and close to a main school entrance. Such an entrance should lead into a foyer, rather than directly into the centre. An outside door from the centre's reading room might lead to a small outside patio or landscaped reading area.[2]

2. Future Expansion

Good school design allows for future expansion. The knowledge explosion, the new technology, and the trend to individualized instruction will have a direct impact on library facilities. The design of a library materials centre must therefore be flexible enough to accommodate future changes in educational procedures and curriculum emphasis. Any design shape, whether it be rectangular, circular, hexagonal, or octagonal, may be aesthetically appealing, but care must be exercised that design does not prevent or hinder expansion. A location adjacent to classrooms or to the outside could facilitate growth, whereas a location restricted by adjacent stairwells and washrooms would inhibit it. Generally speaking, the design should allow expansion in at least one horizontal direction, preferably two.[3]

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[1] Canadian School Library Association, *Standards of Library Service For Canadian Schools* (Toronto: The Ryerson Press, 1967), p. 53

[2] See Ontario Department of Education, Division of School Planning and Building Research, *Library Materials Centres for Secondary Schools* (Toronto: Ontario Department of Education, 1966), p. 1. Some of these location factors are mentioned in this publication.

3. Space

Generally, too large an area or space in a library materials centre can be awesome and inhibiting. Although a large centre with wide structural spans and no bearing walls may be planned, it should be so designed that flexible display screens, casework, furniture arrangements, or stacks divide large areas into smaller ones which are congenial and pleasant. The functions of any space should determine its size and divisions. It is, of course, unwise to make a substantial investment in library facilities without providing sufficient area even for the present program. Carefully arranged facilities, related to function, will determine traffic patterns around the charging desk, card catalogue cabinets, reading areas, and reference areas. Properly designed walls and windows can add greatly to usable space.[4]

4. Environment

The environment of the centre should be pleasant and friendly. Although the library materials centre should be designed functionally, it should not seem institutional. Although there should always be a hum of pupil activity, harsh or loud disruptive sounds are unacceptable. The library should be designed so that the sound of normal conversation will be at an acceptable level. Lighting should for the most part be artificial, as natural sources of light are not dependable.[5] As much as possible, lighting should be glare- and shadow-free. Lighting fixtures should be designed to merge into the overall room design. The area should always be comfortable, regardless of outside thermal conditions. The possible effects of future expansion of the centre on lighting, temperature, ventilation, and sound conditions should also be considered.

5. Aesthetics

Most educators would surely agree that pupils work best in truly functional and attractive surroundings, and that they grow and develop best in an atmosphere of acceptance. The architect should strive to design an area in which young people will enjoy working. The overall effect should be one of comfort and intimacy, encompassing an adroit combination of peace and stimulation. Some link to the outside environment should be provided by windows, but too much use of glass may be undesirable for reasons of function, cost, and aesthetics. What should be aimed at is an harmonious organization of space which links function to form through elimination of the nonessential. Structural elements themselves, when properly used, are often beautiful. Thoughtful use of color is mandatory. If the architect shares with the educator the task of selecting and placing furniture and equipment, chances of achieving overall unity, proportion, and other aesthetic objectives may be improved.[6]

6. Technology

The educator faces the unknown when he contemplates the implications of technology. He finds it extremely difficult to predict the extent to which educational or closed-circuit television, computer-assisted instruction, and a variety of listening and viewing facilities will be used in tomorrow's schools. He does know that there is potential for maximum learning when several senses are stimulated simultaneously. He also knows that much of the hardware and software[7] now available is of inestimable help to teachers engaged in enrichment and remedial work. As aids in more standard instructional tasks, these materials also appear to possess great potential. In our midst, of course, are extremists. Some traditionalists regard technological devices as mere frills, while extreme McLuhanites might abandon schools and transfer learning to the home via closed-circuit TV. Middle-of-the-roaders are now soberly predicting increased use of technology within the school. Before long, most teachers will find TV and others of the newer aids as useful as the traditional chalkboard or wall map.

One of the most important school areas offering technological devices and programs for pupil learning will be the library materials centre. Provision for this equipment must be planned by the educator and the architect in close co-operation. Neither should be permitted to escape full consideration of the technological factor—one that may well be the most important element in the planning of the centre.

7. Prior Consultation

Specialized knowledge is required for designing most areas of a modern school. Certainly this is true in the case of the library materials centre. It is the responsibility of the borough educational specification writer and the school librarian or library consultant to co-operate closely with the architect in preparing design plans for this area. Literature concerning library materials centres should be searched for the soundest educational and design innovations. Business firms specializing in furniture and equipment items for this area should be consulted, and schools which have made noteworthy advances should be visited. The educator should outline carefully the role to be played by the library materials centre in achieving the educational objectives of the school. Its functions, services, and traffic patterns, as well as the age-level needs of its pupils, should be carefully defined. In addition, detailed information of the following kinds should be transmitted to the architect:

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[3] *Ibid.*, p 2.

[4] Office of Education, U S. Dept. of Health, Education & Welfare, *Library Facilities for Elementary and Secondary Schools* (Washington, D.C.: The Office of Education, 1965), p. 36.

[5] *Ibid.*

[6] *Ibid.*, pp. 38-39.

[7] These terms are defined in the Terminology section.

Types and quantities of print media items (reading and reference) to be accommodated
Types and quantities of non-print media items (reference) to be accommodated
Amount of seating and work area required
Desirable shape of the centre; possible interior divisions
Basic areas needed—reading, reference, listening, viewing, etc.
Educational functions to occur within each area
Book sections required
Shelving, stacking, and storage requirements
Amount and types of audio-visual and technological equipment, and their possible uses
Charging desk facilities required
Card catalogue facilities required
Functions carried on in the teacher-librarian's office and workroom
Community uses planned for the area
Washroom facilities required
Overall environmental requirements with reference to sound, lighting, climate control, and color
Special needs.

Recommendations

As stated earlier, there is a trend toward greater emphasis on independent study. To provide for this, more numerous and more varied learning materials and more seating will be required in the library materials centre.

Although many factors will ultimately affect the amount of space assigned to a library materials centre, two in particular will account for most of the space required. These are (a) the size of the basic book and materials collection, and (b) the amount of seating and work area required by the pupils.

1. Size of Basic Book and Materials Collections

The Canadian School Library Association recommends that 5,000 books should be provided within the first three years of operation as the basic collection of an elementary school library materials centre.[8] The Association proposes the continuous addition of books until there are at least ten (but preferably twenty) books per pupil. Enough space, therefore, should be provided to shelve, display, and make 5,000 books available to pupils immediately—perhaps ten to twenty books per pupil eventually. Space for storage and use of such learning materials as periodicals, pamphlets, pictures, maps, slides, films, filmstrips, recordings, and tapes also will be required.

2. Amount of Seating and Work Area Required by Pupils

The Canadian School Library Association also recommends that reading and work areas for individuals and groups in the library materials centre should accommodate 30 per cent of the pupil enrolment at the rate of 35 square feet (gross) per person.[9] We consider this an ideal; in designing the centre and its surrounding areas, we believe that every attempt should be made to allow for future expansion to this optimum. Within the present Metropolitan Toronto Ceiling Cost Formula, however, we may expect to seat and have work space in the centre for a minimum of 15 per cent of projected pupil enrolment.[10]

3. Shape and Partitioning of a Library Materials Centre

The centre should, as far as possible, be an open area, free of masonry. Partitions, if any, should be demountable. Because of supervision problems, long rectangular areas of narrow width should be avoided. Partial separation of areas may be provided by means of movable display screens, casework, low book stacks, furniture, or casual seating arrangements. Enclosed areas should be provided, however, for the teacher-librarian's office and workroom, as well as for the accommodation of certain seminar and audio-visual needs.

Basic Areas Needed in an Elementary School (K-6) Library Materials Centre

The basic areas needed in the centre may be listed as follows:

(1) a reading area consisting of a primary book section, a junior book section, seating, and a small drama or story-telling section,
(2) a resource area consisting of a print materials

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[8] The Canadian School Library Association, *op. cit.*, p. 52.
[9] *Ibid.*, p. 53
[10] See Table 7 (p. 73).

section, a non-print materials section, plus seating and work space (a) in the open floor area, and (b) in enclosed space,
(3) a control area consisting of the charge-out desk and a card catalogue cabinet,
(4) a teacher-librarian's office and workroom area.

1. The Reading Area

This area is used for shelving all types of circulating books—picture books, story books, fiction, and non-fiction. As the name of the area suggests, pupils will come here to select books, to read for enjoyment, or to search for information. In some schools, pupils may come in groups of 30 to 35, according to a prearranged timetable, to select and to exchange books and to read. In such instances a teacher will accompany each group, and she will supervise its activities with the assistance of three or four pupil monitors who will check in and sign out books. Pupils in less structured schools might come to this area for longer periods of time, singly or in small groups of three or four. In still other schools, primary grade pupils might come as a group on a predetermined schedule basis, while junior grade pupils (4-6) would use the library as their individual needs dictated. In a school having an enrolment of about 825 pupils, there should be seating for about 50 pupils in this area.[11]

Pupil activities will be many and varied. Youngsters will thumb the card catalogue for titles, authors, and subjects. They will search the shelves for books to read at home or in the classroom, or for immediate use at library tables. Sometimes they will listen to instructions from a teacher or teacher-librarian. A portable stage may be brought into an open area whenever small dramatic or story-telling performances are to take place.

The books and shelving in this area are generally divided into primary and junior sections.

a. The primary book section
Generally, there are six reading levels in the books shelved in this section. There will probably be some 1,500 to 2,000 books[13] in the collection, from picture books without print, or with limited vocabulary in large type, to more advanced story books with a wider vocabulary and large to medium type. Primary books vary widely in size and number of pages. Overall size and shape will range from approximately 3"x6" to 12"x12". Number of pages will vary from 15 to 100. Books may have either hard or soft covers.

b. The junior book section
In this section will be located both fiction and non-fiction books numbering 2,000 to 3,000[14] or more. They have medium-sized type, 100 to 300 pages, and an average size of 6"x9". Some will be paperbacks. Non-fiction books will cover the social sciences, literature, communications, the physical sciences, mathematics, biography, music, art, crafts, design, hobbies, religions, and language. They may be used within the centre as reference books or borrowed for home use.

c. Shelving and stacking
Books may be shelved in two ways: by perimeter open shelving along outside walls, and by free-standing, single- or double-sided stacks. Such shelving may be included in the building contract or purchased independently as equipment items. Regardless of which method is used, the educator and the architect should work closely together in planning shelving arrangements. The following suggestions may serve as guidelines for educational specification writers and architects:

(1) The librarian should estimate closely the number, size, and type of books to be shelved. The total amount of shelving can be estimated on the basis that 12 to 20 primary story books, or eight junior books, require about one lineal foot. For most standard-sized books, shelving of an 8" width is satisfactory. For picture books. large story books, or illustrated reference books, 10" or 12" shelving will be required. To plan for the future expansion of this area and its shelving, the estimate should allow for the ultimate number of ten to twenty books per pupil.

(2) Shelving height must conform to the height of users. Primary books should be on the lowest shelves.

(3) Primary books are stored in a number of ways. Some may be placed on a slanted shelf with a lip on its outer edge so that their covers may be attractively displayed. Others may be stored vertically, side by side on horizontal shelves. Still others may be stored on lower shelves divided into bins of various sizes, so that the picture and story books can be easily found and used.

(4) In providing shelving, the principle of flexibility should always be observed. The librarian may wish to have shelving moved from one location to another and arranged in different ways as requirements change. Nevertheless, stacks must be so constructed that they cannot easily be overturned.

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[11] This figure is consistent with the current Ceiling Cost Formula, rather than with the ideal situation described by the School Library Association. See pp. 139 and 141.

[13] Again, this is a Ceiling Cost Formula (rather than an ideal) figure.

[14] This reflects the considered opinion of our Library Committee.

(5) All shelving should be adjustable, to accommodate different sizes of books.

(6) To allow easy and neat storage of books, every shelf should be equipped with adjustable dividers.

(7) In order that it may carry a full complement of books without bending or warping, shelving should be of appropriate strength and length.

(8) Space is required on the face edges of all shelves to permit labelling.

(9) Shelf surfaces should be smooth.

(10) If possible, the tops of stack units should provide flat surfaces for displays.

(11) It would be preferable not to have windows above perimeter wall shelving. Opening, closing, and cleaning such windows is difficult.

(12) Heating and air return units should be so located that stack units will not interfere with their operation, and so that heat will not damage books and other materials stored on the shelves.

(13) Careful consideration must be given to lighting requirements in stack areas. Titles and contents of books must be easy to see and read.

(14) Suitable aisle space must be provided between free-standing stacks.

d. Seating

In making initial space allotments, an attempt should be made to provide seating for at least 50 pupils in the reading area (again assuming an enrolment of about 825). Since reading is the main activity here, three kinds of seating arrangements are suggested:

(1) Children may be seated at tables with chairs or stools. (The greatest proportion of the seating should be of this kind. Tables may be of variable shapes and sizes, and each should accommodate from four to six pupils. For this age-level, we do not suggest carrels.)

(2) A few upholstered lounge chairs might be provided.

(3) Many of the younger children will be perfectly comfortable sitting on the floor, with or without cushions, provided the area is carpeted.

Furniture should be attractive, sturdy yet light in weight, and resistant to surface abuse. It must, of course, be appropriate in size and height for children in the five-to-twelve age group. Since children in this age group vary greatly in size, chairs and tables in at least two different heights must be provided. A commonly accepted height[15] for tables is 26" to 28". For chairs, an acceptable height range is 14" to 16".

The seating area should be adjacent to the primary and junior book sections. If it were placed between these two book sections, it could act as a divider. To facilitate supervision and traffic flow, seating should not be located among free-standing stacks or too close to them.

e. Drama or story-telling section

Some educational authorities wish to provide an area for story-telling in the circulating book section of an elementary school library materials centre. It is here that pupils may retell or dramatize the events of a story recently read. A small group of pupils might even dramatize a story by means of a puppet show. Their listeners might sit on the floor (if it is carpeted), or on small benches, or on chairs. A small portable stage might be provided. Such an area should accommodate about 30 pupils.

2. The Resource Area

This area of the library materials centre will be used by all pupils and teachers. Pupils may come singly or in small groups in response to their need to search for information in print and non-print forms.

The area should be able to accommodate at least 50 pupils. Its use will not be strictly timetabled in any way. If too many pupils were to arrive at one time, however, the teacher-librarian would need to suggest alternate times.

Pupil activities here will be more varied than in the reading area. There will be greater demand for work space. Pupils will read, write, listen to records or tapes, make models or diagrams or charts or maps, make notes or outlines or pictures, preview films or slides or filmstrips, plan and work at projects, make tape recordings or transparencies or overlays, read magazines or newspapers, and plan presentations in many areas of the curriculum. They may work singly or in small groups. They will often ask for the assistance or advice of the teacher-librarian. A low hum of activity and conversation will characterize this area.

a. Its materials

The collection should contain both print and non-print materials as follows:

[15] Canadian School Library Association, *op. cit.*, p. 63

Print materials
(approximately 1,000 reference books plus other materials):

(i) reference books such as encyclopedias, dictionaries, books of authors, atlases, indexes, yearbooks, almanacs, biographical dictionaries, handbooks, and geographical and historical encyclopedias,
(ii) duplicate copies of certain important non-fiction books which are found in the circulation section of the centre,
(iii) pamphlets, periodicals, and magazines covering the physical sciences, nature, safety, health, government, history, people, other lands, art, crafts, hobbies, mechanics, design, and music,
(iv) programmed learning materials,
(v) pictures of all kinds and sizes,
(vi) maps and charts,
(vii) teachers' professional books and periodicals covering such subjects as administration, learning, teaching, and curriculum.

Non-print materials:

(i) slides (black and white, color),
(ii) filmstrips,
(iii) film (8 mm. and 16 mm. sound),
(iv) records and tapes (speeches, poetry readings, dramatic scenes),
(v) transparencies,
(vi) models and globes,
(vii) realia items such as stones, coins, and nature objects,
(viii) video-tapes,
(ix) microfilm (in the future).

Since much of the non-print material is audio-visual, the following equipment should be permanently located and used in this section of the library materials centre:

Slide and filmstrip projectors
Small viewers
Overhead projector
Opaque projector
Sound projector (16 mm.)
Filmloop projector (8 mm.)
Tape recorders (with headsets)
Record players (with headsets)
Radios (with headsets)
Programmed learning equipment
TV receiver (with headsets)
Microfilm reader (in the future)
Wall screen
Equipment cart.

b. Shelving, stacking, and storage of priht materials
The principles of shelving and stacking given in the earlier section also apply here.

Reference books in the amount of about 1,000 will be shelved in this section. Therefore, not as much shelving will be required as in the reading area. The following additional information may be of assistance:

(1) Since this section of the centre will be used more by pupils in the junior grades (4-6) with ages ranging approximately from nine to twelve years, the height of the shelves, stacks, tables, chairs, and counters should conform to the physical development of these children.
(2) The sizes and shapes of the reference books will vary from 6"x9" to 12"x16". They will be mainly hard-covered books 1" to 4" thick.
(3) The formula used for estimating shelf requirements is eight books per lineal foot, for standard reference books, and six books per lineal foot, for oversize reference books.[16]
(4) Most of these books will be shelved vertically on horizontal shelving (not on slanted shelves). Shelf widths will vary from 8" to 10" to 12".[17]
(5) Very large atlases are best stored flat, rather than upright, in atlas stands or on shelves. Shelves 24" wide and 22" deep with a 3" clearance between shelves are suggested.[18]
(6) Large one-volume unabridged dictionaries should be kept flat and open, rather than upright. The shelf surface should be 24" wide and 14" deep.[19]
(7) Encyclopedia sets may be more conveniently placed in free standing and double-faced counter-height sections of shelving.[20]

Pamphlets, periodicals and magazines must also be shelved and stored. Only current issues should be displayed. Back issues should be conveniently stored for reference purposes. Number of titles will vary from centre to centre. Periodicals can be kept in vertical file units, on open shelves of sufficient depth, or in legal-size filing cabinet drawers.

Newspapers are valuable for reference purposes in an elementary school. The centre should subscribe to a few newspapers. Copies of these may be left on tables, on counter tops, or on shelving. If desired, a newspaper display rack might either be built or purchased.

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[16] Ontario Department of Education, Division of School Planning and Building Research, *op. cit.*, p. 8.

[17] *Ibid.*, p. 6.

[18] *Ibid.*, p. 8.

[19] *Ibid.*, p. 9.

[20] *Ibid.*, p. 8.

Pictures are also essential to a good elementary school resource area. Eventually, the area will possess hundreds of pictures from many sources. They are normally mounted on stiff cardboard, catalogued, and stored for reference purposes in legal-size or X-ray type filing cabinets.

Maps and charts also have a role in the school program. Many of these may be mounted on cardboard and may be as large as 3′ x 3′. The teacher-librarian (or, if none has been appointed, a library consultant) should analyze the school's practices with the architect to determine its specific map-storage and chart-storage requirements. Such items may sometimes be stored vertically in bins equipped with dividers.

c. Shelving, stacking, and storage of non-print materials

Some system of easy location for all non-print materials is essential. Centralized cataloguing may be available for at least some of the films, filmstrips, records, and tapes. Slides, transparencies, models and globes, and especially realia are more difficult to cope with by traditional cataloguing methods. A simple where-to-look file might suffice. But because of the growing use of this type of material, one librarian would be unable to prepare it.

Slides, by the hundreds, will accumulate in the resource area. Casework units might be designed with drawers equipped with dividers and with drawer fronts equipped for slide indentification. Commercially purchased boxes equipped with dividers might also be used.

Filmstrips, in large numbers, will be used. Custom-designed storage facilities might be used, or commercially purchased filmstrip storage units might be obtained.

Film may, in some instances, be stored in schools. (Normally, however, centrally located audio-visual units operated by school boards supply films for schools.) Where films are kept in the school, many cannisters will probably accumulate. These should be placed in free-standing or wall-mounted racks or in a specially designed casework storage unit.

Records may be stored in open bins mounted on a raised base, with the records accessible from the top of each bin. A system of dividers might keep the records separated. A few hundred records might eventually accumulate.

Tapes will be found in schools much more frequently in the future. They should be stored in casework units or on shelves designed to accommodate specific types of tape used.

Transparencies for overhead projector use will accumulate in large quantities. They should be stored in cardboard mountings measuring 9½″x12″. These might be stored in legal-size filing cabinets or in specially designed casework drawers.

Models and globes, because of their various sizes and shapes, are difficult to display and store. These items might be grouped together in a section having specially designed casework units which possess potential both for storage and display. Alternatively, models and globes might be placed on the tops of stacks, in cupboards, or on shelves.

Realia items such as coins, stamps, stones, or leaves may be kept in open or lidded boxes, tote boxes, bottles, albums, or cupboards. They may also be stored on deep shelves.

d. Storage of audio-visual equipment

Shelf storage in specially designed casework units should be provided for this equipment. The following is a list of equipment which should serve the needs of from 550 to 825 pupils:

2 slide and filmstrip projectors
4 filmstrip viewers
4 slide viewers
1 sound projector 16 mm. (on a mobile cart)
2 (super) cartridge projectors (8 mm.), with or without sound (one projector per enclosed multi-purpose room)
1 overhead projector
1 opaque projector
4 filmstrip-slide projectors
1 television receiver (large screen) on a mobile stand
4 tape recorders (each with listening station and 9 headsets)
4 record players (each with listening station and 9 headsets)
6 filmstrip viewers
1 screen for each enclosed multi-purpose room.

Since demand for this equipment will probably increase, it is suggested that provision be made to store a somewhat larger quantity of audio-visual equipment than this list would indicate.

e. Seating and work space in the resource area

For the immediate future, at least 50 pupils should be accommodated in this area. (Provision should be made for future expansion.) Facilities should be provided here for (1) work which may be performed in the open area, and (2) work which calls for enclosed space.

Facilities for work which may be performed in the open area would consist of different shapes and sizes of work tables, each designed to accommodate from four to six pupils. These will be used for reading and writing. They should be located close to the reference book collection.

In K-6 schools, carrels should be provided only for audio-visual listening and viewing purposes. It is suggested that from six to twelve carrels thus equipped be supplied.

At least two project tables should be provided. These should be of sufficient length and width to permit three pupils per table to work at charts, maps, or display material. They may sit or stand to do this work. Such tables should have durable work surfaces.

Facilities for work which calls for enclosed space would consist of two enclosed multi-purpose rooms. They might be approximately 150 square feet each, adjacent to each other, and divided by an operable partition. Preferably, they would be located close to or adjacent to the library workroom. The partitions enclosing these rooms should offer a very good acoustical barrier. Since educational requirements will change, the partitions should be demountable. The rooms should be capable of being darkened.

These enclosed rooms will serve two principal purposes: (a) *an audio-visual purpose* of viewing 8 mm. or 16 mm. sound films, slides, and filmstrips, and of tape recording classroom presentations and listening to records or tape recordings, and (b) *a planning and seminar purpose* of permitting small groups of from six to eight pupils to prepare materials for later classroom presentations. They will also provide space for preparation of transparencies and selection of slides, records, tapes, or charts. Here, also, teachers can work with pupils in planning, discussing, and deciding on the forms of later presentations.)

Each room should be designed for noisy activities. Counter space of suitable height for these children should be provided. There should also be open shelves above and below the counters for storage of all the audio-visual equipment and materials. Electric outlet jacks for audio-visual or computer-assisted instructional devices should be at counter height. In each room there should be sufficient space for one or two free-standing work tables and eight or ten nesting chairs of appropriate sizes for the children. Provision should be made for chalkboard and tackboard facilities. A screen mounted on the wall or suspended from the ceiling should be located at one end, and this should be adjustable for various types of projection.

3. The Control Area

This area will include (a) a charging desk, and (b) a card catalogue cabinet.

a. The charging desk

This is a free-standing furniture item, either provided for within the building contract or purchased as a furniture item from a firm specializing in library equipment. If it is included in the building contract, the architect should acquire a complete understanding of its functions and obtain exact specifications for its component parts from the teacher-librarian or library consultant.

All materials in the centre should be handled at the charging desk.[21] Materials are checked out and returned here. The desk should occupy a central position commanding a view of all sections. It should also be close to the main entrance of the centre and to the teacher-librarian's office and workroom.[22] There should be sufficient length and counter surface to permit at least two persons to work at the charging desk at one time.[23] For an elementary school unit, a sitting height of 30 inches is usually considered satisfactory.[24] It is estimated that the charging desk and its required working area will take about 75 square feet of space.

The four main components of the charging desk are space for the book card trays, shelves for returned books, storage drawers, and kneehole spaces for at least two seated persons.

The book card trays should preferably be located in a well on the counter surface. The number of trays will depend on pupil enrolment. A school having an enrolment of 550 to 825 pupils would need five card trays,[25] although most commercially purchased charging desks contain seven trays in order to allow for increases in library use. The trays hold cards 5" high by 3" wide. Trays should therefore have inside dimensions slightly in excess of these sizes.

Shelves for returned books should be bunk-type and about 30" wide under the counter in the centre section of the unit.[26]

At least two storage drawers of sufficient depth are needed for miscellaneous supply items.

The two kneehole spaces should be at least 30" wide and located sufficiently apart for work purposes.

[21] *Ibid.*

[22] *Ibid.*

[23] *Ibid.*

[24] *Ibid.*

[25] *Ibid.*

[26] *Ibid.*

Counter-top width and length, as well as the shape of the charging desk, are local decisions.

b. The card catalogue cabinet[27]
This is a free-standing, expandable furniture unit mounted on a leg base or stand and of a height suitable for the children. For maximum accessibility, it should be located in a central position. It should also be close to the charging desk and to the workroom. The number of drawers in the cabinet is determined by the size of the total collection.
On the average, five cards are placed here for every book and four cards for every item of audio-visual material. The catalogue will be used by both teachers and pupils.

Card drawers must hold 3"x 5" cards, and space must be allowed for guide cards which show above the 3" height of the cards. Commercially purchased units have cabinet drawers with inside-dimension measurements of $5\frac{1}{8}$" wide, $3\frac{1}{2}$" high, and 15" long. Each drawer contains approximately 1,000 cards and guide cards. The standard method used to estimate the number of drawers is as follows:[28]

500-pupil enrolment	30 drawers
800-pupil enrolment	40 drawers
1,000-pupil enrolment	50 drawers
1,200-pupil enrolment	60 drawers

4. Teacher-Librarian's Office and Workroom Area

The Canadian School Library Association has recommended the following staff allotments for the kind of library materials centre they have described:[29] (a) one teacher-librarian for the first 300 pupils, (b) one additional teacher-librarian for each additional 500 pupils, and (c) one clerical assistant for each 500 pupils.

At present, one full-time teacher-librarian is generally assigned to the library materials centre, although very occasionally, at times of special need, a part-time clerical assistant or secretary might be lent by the principal's office. However, as the library function grows in relative importance within the school and as the value and needs of the centre are fully understood in relation to emerging trends, additional personnel will be needed. At some future time, for example, there might be another teacher-librarian and a regular part-time or full-time clerical assistant—which, of course, would be more in line with the recommendations of the School Library Association. Obviously, the architect should also keep in mind the fact that this particular section and its furnishings are intended for staff rather than pupil use.

Some of the following activities will occur in this office-workroom space:[30]

Selection and ordering of materials,
Receiving and planning for the distribution of materials,
Making minor repairs,
Reading, researching, and cataloguing both print and non-print materials,
Mounting pictures and transparencies,
Working on order lists, budget, and inventory,
Advising staff and pupils on materials,
Drafting book talks and compiling bibliographical materials.

Assuming a staff of one librarian and one part-time clerical assistant, the combined office-workroom area should be approximately 250 to 300 square feet in area. The partition system should make provision for its expansion. The office-workroom should have easy access to the reading and the resource areas, and it should have as clear a view as possible of the whole library materials centre, including the charging desk. A glass partition of minimum size and above the 30" level would assist in meeting these requirements.

In the office section of this area, provision should be made at present for a teacher-librarian's desk and chair, a small second desk or table, two or three side chairs, a typewriter, and a four-drawer filing cabinet. Much of this equipment could consist of built-in casework items with appropriate kneehole spaces. Conveniently located electrical outlets will be needed for typewriting and audio-visual use. This area should also be supplied with outside telephone and school communication devices.

The workroom section should have as much counter space as possible. The counter top should have a durable work surface and be water-resistant.
A sink with hot and cold water is required. Wide, adjustable, open shelving should be located above the counter and should reach to the ceiling.
Below counter level there should be adjustable shelving, drawers for supplies, and cupboards.
A coat closet should be provided.

a. Washrooms
Pupil washrooms should be located close to, but not in, the library materials centre. Since the centre should fulfil community as well as school obligations, the foyer or corridor system leading to this area should provide access to both adult and pupil washrooms.

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[27] *Ibid.*, p 9

[28] *Ibid.*, p 12

[29] Canadian School Library Association, *op. cit.*, p 59.

[30] *Ibid.*, pp 11-13.

Environmental Requirements of a Library Materials Centre

As indicated in an earlier section, the physical environment of a library materials centre is widely believed to have a direct bearing on the learning process. From the educational point of view, therefore, the following suggestions are pertinent:

1. Sound

A soft sound environment is required. Sudden and harsh sounds are disruptive. A criticism commonly made by pupils and teachers concerns noise emanating from ventilation or duct systems or, if the library is poorly located, impact noises from other areas. Audio-visual activities are best confined to enclosed spaces offering good acoustical barriers. The designer should take steps to reduce to a minimum the sounds of activity and industry in the centre. This suggests consideration of carpeted floors and acoustically treated ceilings. Both would help to provide surroundings we believe to be conducive to better habits of working, reading, learning, and deportment.

2. Windows

The design of windows can present complex problems. Educators believe pupils should not have to work in an area with excessive sunlight glare or in extreme temperatures.[31] Excessive window area means excessive expenditure for drapes or blinds. The possibility of window breakage is also an important factor. Where windows are placed in certain locations, moreover, librarians will resent loss of perimeter wall space. Nevertheless, pupils should have some visual link with the outside world.

All of this suggests that some windows are probably needed, but that too much window area should be avoided. Also, it seems obvious that artificially controlled temperature and lighting are desirable.

3. Lighting

As suggested above, lighting should be provided as if no other light source were available. The educator prefers lighting fixtures which are unobtrusive. There should be an adequate level of illumination, and it should be without glare or shadow.[32] In the stack area, pupils should be able to read the titles and contents of books easily. In general, lighting should permit comfortable and efficient reading and writing. Separate switching devices are needed for the various sections of the centre. The lighting system should be adjustable enough to permit rearrangement and expansion of the centre.

4. Climate Control

Many educators are keenly conscious of a connection between learning efficiency and temperature and humidity levels.[33] They believe that too cold a temperature can cause distraction and discomfort and that too warm a temperature can cause inattention and sleepiness. Regardless of outside temperature, therefore, the internal temperature should always be comfortable. The relative humidity should always be satisfactory both for the health and comfort of the occupants and for the preservation of the stored materials. The area should be free of odor and dust.

Since perimeter wall areas can have desirable educational uses, especially for book shelving, carrels, and tables, heating and air return units should be carefully located. Zone control is suggested to ensure that the temperature within the centre is appropriate for the activities occurring there (rather than for those taking place in the gymnasium or the kindergarten). The mechanical system should be flexible enough to permit easy rearrangement or expansion of the centre.

5. Color

Color can enhance or damage any design. Young children require a stimulating and exhilarating color environment. Depressing colors should be avoided. Light colors are needed in stack areas to increase light reflection.

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[31] John H. Herrick, Ralph D. McLeary, Wilfred F. Clapp, and Walter F. Bogner, *From School Program to School Plant* (New York: Henry Holt and Company, 1956), pp. 426-427.

[32] *Ibid.*, p. 617. See also H. Richard Blockwell, "Lighting the Library—Standards for Illumination," and Brock Arms, "Principles of Illumination of Libraries," *The Library Environment Aspects of Interior Planning*, ed. Frazer G. Poole (Chicago: American Library Association, 1965.)

[33] John W. Schaefer, "Introduction to Climatic Control for Existing Buildings," *1965 Annual Proceedings*, Association of School Building Officials, Chicago, Ill., p. 548. See also Iowa Centre for Research in School Administration, *Thermal Environment and Learning*, A Report Prepared by the Centre (Iowa City: University of Iowa, 1966-67) and Robert B. Ford, "Cool Class, No Sweat for Teachers," *American School Board Journal*, CLII (May, 1966), 48.

Level	Square Feet	Area	Page Number
K-6	3400 ±	Library Materials Centre	149

Environmental Criteria

Atmospheric Criteria

			Desirable	Tolerance
Temperature	outside temperature	> 90 F°	78°	± 2°
		< 0 F°	72°	± 2°
Relative Humidity	outside temperature	> 90 F°	50%	± 5%
		< 0 F°	30%	± 5%
Outside Air		CFM per sq ft	0.3 to 0.8	> 0.1
		CFM per person	15 to 30	> 8
Air Changes		per hour	6 to 8	> 5
Air Movement		velocity: FPM	25 to 40	15 < 40
Room Pressure		in. WG	+ 0.10	> + 0.05
Air Filter Efficiency		> 5μ	80%	> 65%
		< 4μ	45% to 80%	—

Odors Body

Population	max 180	min 0

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Yes	View In Yes	Blackout No	Privacy No
Daylight Yes	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		
Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			varies		

Remarks

Double glazing

Co-ordinate planning of heating elements in relation to usable wall space, shelving, etc.

Acoustical treatment of floor & ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel No
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1φ for AV equipment			
Other			

Remarks

Notes

Level	Square Feet	Area	Page Number
K-6	250-300	Library Work Room	151

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance	Remarks
Temperature outside temperature	> 90 F°	78°	± 2°	
	< 0 F°	72°	± 2°	
Relative Humidity outside temperature	> 90 F°	50%	± 5%	
	< 0 F°	30%	± 5%	
Outside Air	CFM per sq ft	0.5	> 0.1	
	CFM per person	15 to 30	> 8	
Air Changes	per hour	6-8	> 5	
Air Movement	velocity: FPM	25 to 40	15 < 40	
Room Pressure	in. WG	− 0.05	< 0.00	
Air Filter Efficiency	> 5μ	80%	> 65%	
	< 4μ	45% to 80%	—	
Odors				

Population	max 6	min 1

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Yes	View In Yes	Blackout Yes	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	77	77

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain No	Exhaust Consider—smoke & duplicating	
Other			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System No		Clock System Yes	TV Terminal Yes
Computer Terminal No		Underfloor Duct System No	
Power 110V—1 ϕ for AV and office equipment			
Other			

Remarks

Notes

Level	Square Feet	Area	Page Number
K-6	150 (× 2)	AV Room	153

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature outside temperature	> 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity outside temperature	> 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	15 < 40
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5μ	80%	> 65%
	< 4μ	45% to 80%	—

Odors Body (smoke for adult use)

Population	max 12	min 1

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In Yes	Blackout Yes	Privacy No
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	77	77

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Consider smoke exhaust	
Other			

Remarks

Electrical Services

PA Yes	Intercom No	Handset No	Bell Tel No
Program System No		Clock System No	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1 ϕ for AV equipment			
Other			

Notes

Chapter 13
The Counselling Centre

Guidance in schools is a service which emphasizes the uniqueness, dignity, and inherent worth of the individual child in the total educational program. Its purpose is to enable pupils, parents, and teachers to make wise decisions. The prime vehicle of guidance in elementary schools is the counselling process. This may be defined as "professional assistance given to an individual which helps him make wise choices, assists him in utilizing his potential, and aids him in becoming self directive."[1]

Underlying all guidance and counselling work are a number of moral principles and assumptions. Guidance and counselling people work on the premises, for example, that "the child [must be treated as] a person in his own right and not merely an economic unit,"[2] that differences among children in their talents and patterns of growth should be recognized and respected, and that each child has the right to exercise freedom of choice and to assume responsibility for his own actions. It is also taken for granted that each child has the desire for self-enhancement in ways "that are personally meaningful to him,"[3] and that he has within him resources for achieving fulfilment and adjustment.

Educators and others who have taken note of the accelerating rate of change confronting our society are concerned that tomorrow's young adults should be equipped to live successfully in a rapidly shifting environment. It now seems well accepted that "there will be a much greater premium on independent, self-directed, self-programmed, self-paced learning in the next few years."[4] And in his pursuit of this new kind of learning experience for his students, one of the teacher's strongest allies will be the guidance service—particularly its counselling facilities. For it is the central aim and function of guidance and counselling services "to engender . . . a set of problem solving skills and attitudes which will permit the pupil to face new emergencies as they arise."[5]

Significance of Guidance in Early Childhood

Guidance and counselling are particularly significant in the early school years. These are the years when the basic style of life and self-concept[6] begin developing their unique patterns. In these years, counselling can be most helpful in clarifying tense feelings, blurred concepts, and emerging goals. The eminent American educational psychologist Benjamin Bloom points out that achievement in the first three grades is an excellent predictor of a child's total pattern of later achievement.[7] A well-known expert on school guidance, Don Dinkmeyer, says that "the elementary school child is still in the process of becoming: physically, emotionally, and in total personality."[8] The child's identifications are still not fixed, and counsellors can help in building a mutual sense of trust as a means of nurturing growth.[9]

Guidance in elementary schools should not be merely a downward extension of guidance procedures and emphases commonly found in secondary schools. It should not be crisis-oriented, nor should it be responsive exclusively and/or primarily to the needs of those who voluntarily seek assistance. A three-fold set of goals, suggested by M.Toby Mindel of the Merrill-Palmer Institute, Detroit, to American guidance specialists, would appear to be closely in harmony with the objectives of those who propose full-scale guidance programs for our own elementary schools.

Mindel's goals are (1) to "maximize the development of all children within the school"; (2) to "assist the administration in improving the continuity, sequence and integration of guidance services of the school and the community"; and (3) to "improve the competence of the teacher to a level where she can operate effectively as a guidance person within the classroom."[10]

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[1] Dean L.Hummel, "Guidance Program—General Considerations for its Organization and Administration," *Guidance and the School Dropout*, ed. Daniel Schreiber (Washington, D.C.: National Education Association and American Personnel and Guidance Association, 1964), p. 125.

[2] Ontario Secondary Education Commission of the OSSTF, *Guidance, A Resource Booklet* (Toronto: Ontario Secondary School Teachers' Federation, 1966), p. 9.

[3] Kenneth B.Hoyt, "Attaining the Promise of Guidance for All," *Personnel and Guidance Journal*, XLV (February, 1967), 625.

[4] Adolph Unruh and O.T.Richardson, "Counselling in An Age of Change," *The School Guidance Worker*, XXII (February, 1967), 35.

[5] Henry Weitz, *Behavior Change Through Guidance* (New York: John Wiley and Sons, 1964), p. 65.

[6] J.Piaget, *The Child's Conception of the World* (New York: Harcourt, Brace, 1929).

[7] Benjamin Bloom, *Stability and Change in Human Characteristics* (New York. John Wiley and Sons, 1964).

[8] Don Dinkmeyer, "Developmental Counselling in the Elementary Schools," *Personnel and Guidance Journal*, XLV (November, 1966), 262-66

[9] Mary B Lane, "Creative Thinking on Critical Needs of Children," *Childhood Education*, XLIIX (September, 1966), 30-39

If elementary schools in Metro are to provide guidance services which are developmental and continuous, and which are planned to serve all children, directly or indirectly, they will need full-time, qualified counsellors and adequate physical facilities.

Guidance as a Co-operative Enterprise

Guidance requires a team approach, involving many individuals who influence the lives of children in the elementary school. Guidance can never be the exclusive domain of one person, nor can it be parcelled out neatly among the counsellor, the teacher, the school nurse, the parent, the school psychologist, and the social worker. Ideally, the varied competencies and efforts of the entire staff within the total educational program of the school should be integrated into a single, co-ordinated, professional service whose goal is "to evoke the potential of each child and help him find direction and meaning in learning."[11] Such a program can reach children in three mutually supporting ways: (1) by employing a "direct person to person approach when needed"; (2) by employing a "special group approach for orientation to school, for information about educational choices,...for assistance in normal developmental problems and for group testing"; and (3) by "using the total educational program of the school to create a . . . climate conducive to the maximal development of the native talents of the individual child and of good mental health."[12]

Guidance counsellors can establish supportive relations with children. So can teachers who have suitable personal qualifications and professional preparation and who have the opportunity of working in collaboration with consultants. Through specialists such as school psychologists, social workers, and attendance officers, these counsellors and teachers can establish liaison with outside agencies and gain access to special data, tools, techniques, and a wealth of background and experience.[13]

In-Service Education of Elementary School Guidance Counsellors

In comparison with more traditional types of teacher training, preparation programs for guidance workers in elementary schools are relatively new. Consequently, there is an urgent need for in-service education of guidance counsellors. Guidance facilities in elementary schools should, therefore, be planned to meet the demands of in-service education. Provision should be made for case studies, case conferences, meetings with consultants, supervised practice in counselling, and research in counselling.

Guidance Activities and Personnel

Guidance counsellors make it their objective to contribute to the general improvement of pupils in scholastic achievement and in adjustment to the school environment. Among the activities designed to promote this goal are the attempt to identify, at an early stage, those pupils who need special services. Another activity of this type is the promotion of increased understanding of the school's aims and policies on the part of pupils, parents, and teachers. As the trend toward individualized instruction gains momentum, guidance counsellors may often be able to advise teachers concerning appropriate curricular offerings for individual children with whom the counsellors have been working.

The following is a list of some particularly significant guidance and counselling functions:

(1) interviewing children, parents, teachers, and consultants;
(2) individual counselling and group counselling—the latter sometimes involving groups of three or four, sometimes groups of eight or ten pupils;
(3) appraising children, partly through such activities as administering standardized tests for readiness, academic achievement, emotional maturity and stability, and general academic intelligence;
(4) maintaining records consisting of teachers' recommendations, interviewers' notes, consultants' reports, anecdotal accounts, and follow-up briefs, together with information concerning pupil growth and attendance;
(5) providing information in an effort to orient children and parents to elementary school objectives and programs, to secondary school offerings, and to educational requirements, working conditions, and opportunities in broad vocational fields which may much later be open to the child;
(6) working toward curricular improvements through participation in deliberations of subject committees,

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[10] M.Toby Mindel, "The Role of the Guidance Specialist in the In-Service Education of Teachers," *Personnel and Guidance Journal*, XLV (March, 1967), 693.

[11] H.Smallenburg, "Cooperative Efforts in School," *Childhood Education* XLIII (March, 1967), 400.

[12] Edward Lundy, "Implementing Change in Programs of Pupil Personnel Services," *Guidance in American Education II: Current Issues and Suggested Action*, ed. Edward Lundy and Arthur M.Kroll (Cambridge, Mass.: Harvard Graduate School of Education, 1964), p. 304.

[13] K.M.McIntyre, "Guidance and Psychological Services in the Elementary Grades (Kindergarten-Grade 8) in East York," East York Board of Education, 1967, p. 4. (Mimeographed.)

in evaluation studies, and in meetings concerned with scheduling;
(7) helping teachers to increase their understanding of the developmental needs and growth patterns of children, including those of exceptional children.

In an elementary (K-6) school containing somewhere between 550 and 825 children, this work can be accomplished by one guidance counsellor, with some secretarial assistance, provided that at least some of the teachers are sufficiently interested and sufficiently well qualified in counselling to devote part of their time to working in the centre.

User Requirements

As yet, very few elementary schools in Metro possess specialized facilities for a regular program of guidance and counselling. This cannot be taken, however, as an indication that such facilities need not be considered when new schools are being planned. In fact, there is a growing realization among elementary school people everywhere that if special services and remedial measures are to have maximum impact, learning disabilities must be identified early.[14] Furthermore, as we have seen, the trend toward individualization of instruction will in all likelihood create a much expanded role for counselling services in relation to the curriculum.

Generally speaking, the nature and extent of the guidance and counselling services planned or envisioned will determine the arrangement of facilities. Whatever decisions are made concerning these facilities, it should be remembered that the counselling centre design should be a flexible one—a design which will permit alterations. Such modifications will probably be necessary if the counselling program is altered or expanded in response to developments such as a shift to co-operative teaching, large-scale use of educational television, or some new application of the computer.

One American writer on guidance advocates four basic guidelines concerning physical facilities for counselling:

(1) The physical setting where the counsellor works should be comfortable and attractive,
(2) The counselling setting should be designed to accommodate groups of children as well as individuals,
(3) The physical arrangements should be structured so as to permit and encourage using play media...,
(4) The setting should permit observation of counselling by counsellors-in-training, and should provide to the certificated counsellor the in-service training advantage of observation.[15]

1. Space

The total space required for a counselling centre will be a function of the nature and extent of the services to be provided, the present enrolment and enrolment projections of the school, the socio-economic character of the neighborhood, and the Ceiling Cost Formula.

It is suggested that to initiate a counselling program in an elementary school with 550-825 pupils, a minimum floor area of 400 square feet should be allocated. This space might be subdivided as follows:

school counsellor's room	120 sq. ft.
counselling-testing room	100 sq. ft.
counselling-consultation room	100 sq. ft.
reception area	80 sq. ft.

2. Location

The location of the counselling centre should be determined by the part it plays in the total program. Generally, it will be advantageous to have the counselling centre near the library materials centre, the health centre, and the administrative offices. The guidance counsellor will probably want to use many print and non-print materials and aids which can be provided by the library. The counsellor also needs convenient access to health records of pupils and to the administrative suite.

Guidance services should be located close to the main school entrance, since many parents will visit the counselling centre for consultation. The location of the service should also be convenient to classrooms and teachers. Further, it must be a quiet place, protected from areas of heavy traffic flow and from noisy activities such as those of the gymnasium.

3. Internal Space Arrangements and General Atmosphere

Within the counselling centre, the various areas should be arranged to ensure a smooth flow of traffic. A reception area should function as the entrance to the centre. From this area there should be direct access to counselling rooms. Moreover, there should be provision for a constant flow of traffic between the counselling rooms and the school counsellor's office. Records storage should be located close to the counselling rooms. It should be possible to lock all storage cabinets containing test results and other confidential records.

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[14] This seems to be one of the key implications of the findings of Bloom, which are referred to on page 155 of this Report.

[15] Richard C.Nelson, "Physical Facilities for Elementary School Counselling," *Personnel and Guidance Journal*, XLV (February, 1967), 552

Layout, colors, and furnishings in the centre, as a whole, should be calculated to contribute through their aesthetic effect to the growth and maintenance of a positive mental attitude within the child—an attitude which is a blend of self-assurance and realism concerning his own abilities and goals.

4. *Specific Areas*

a. The school counsellor's office

This room, with an area of approximately 120 square feet, is the nerve centre of the guidance complex. It will be used for counselling sessions with children, for consultation with parents, teachers, and specialists, and for co-ordinating other guidance functions.

Since a major portion of the counsellor's time is devoted to individual and small-group counselling, his office should be planned to facilitate this kind of activity. The atmosphere should be pleasant and relaxed, and there should be adequate ventilation, suitable lighting, and complete visual and acoustic privacy. Carpeting and specially treated walls may be of assistance in creating a desirable psychological climate as well as in soundproofing the office. To prevent the area from having a cell-like atmosphere, a translucent panel might be installed in the wall or in a door separating this office from the reception area.

The office should be equipped for telephone and intercommunication systems, and it should have sufficient electric outlets. A tape recorder should be available.

Furniture might consist of a small writing table which would serve as the counsellor's desk, a chair for the counsellor, three or four comfortable side chairs to accommodate children and adult visitors, and a low table. In addition, provision should be made for storage of professional books, reference books, periodicals, and prediction and conversion tables, as well as for securable filing of test results and other confidential information.

There has appeared to be consensus among members of our guidance committee that the training of counsellors-in-training and interns in counselling can be greatly facilitated by installation of a one-way vision panel between the school counsellor's office and the counselling-consultation room (or conference room, if one exists). This opinion is also reflected in the educational specifications for guidance facilities published a few years ago by the Indiana State Department of Education.[16] Our guidance committee was concerned, of course, that it should be possible to close off the vision panel and disconnect the intercommunication system whenever visual and acoustic privacy are desired.

The question of providing viewing and listening facilities in such a setting, however, can give rise to concern on the part of the educator who places a value upon the right of the child to privacy. In cases involving adult persons, the legal principle of privacy has an important place in many countries. In a recent article concerning privacy rights of children in educational settings, Professor Joanne Reynolds[17] of the City University of New York points out that in law the rights of "persons" have gradually been extended to "more and more categories of individuals, such as slaves, women, and children."[18] She concludes:

> *Children's rights to privacy might be argued on legal, psychological, religious, or moral grounds.*[19]
>
> *One aspect of privacy . . . is the right of the individual to choose those aspects of his being and his behavior which he will or will not reveal to others.*[20]

To those who propose sacrifice of these privacy rights as a means to some worthy end such as improved teacher-training or research into child behavior patterns, Dr. Reynolds recommends consideration of the means-ends relationship, plus careful control over the way any information so gained is used.[21]

It is in a spirit of extreme caution that this Report approaches the matter of observation facilities for the counselling centre. We have no wish to impugn the professional ethics of counsellors, nor have we any desire to deny that counsellors and other educators may have strong reasons for urging architects to incorporate observation and listening facilities. Nevertheless, we believe that such installations should be made—if at all—only after the most careful consideration. Can written parental permissions be obtained? Are the teachers and counsellors to be observed also willing to sign appropriate consent forms? Above all else—what are the psychological and moral aspects of surreptitious observation in so far as they may affect children?

b. The counselling-testing room

This room should be suitable both for counselling and for individual and group testing. It is suggested that its area be approximately 100 square feet and that its shape, preferably, be square (10′ x 10′), so that in combination with the counselling-consultation room to be described below it may be enlarged into a conference room of 200 square feet. The counselling-testing room should accommodate three or four persons (some children, some adults) in visual and acoustic privacy. A small writing table, three or four comfortable chairs, one 27″ x 42″ table of regular height, plus casework, shelving, securable filing space, stop watches, interval timers, tests, test manuals, norms, and conversion tables complete the list of basic equipment and supplies. A child-sized table and chairs should be easily available. This room should also be equipped with electric outlets.

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[16] Bruce Shertzer, Robert J. Nelson, and Rolla F. Pruett, *Educational Specifications for Guidance Facilities*, (Indianapolis: Indiana State Department of Public Instruction, 1962), p. 9.

[17] Joanne Reynolds, "Children's Privacy and Compulsory Schooling," *Teachers College Record*, LXVIII (October, 1966), 33-41.

[18] *Ibid.*, p. 34.

[19] *Ibid.*

[20] *Ibid.* p. 37.

[21] *Ibid.*

c. The counselling-consultation room
Similar to the counselling-testing room in area, in general furnishings, and in privacy features, the counselling-consultation room should be equipped for three or four persons but will not have the testing orientation of the other room. No file cabinet is needed. A small writing table (not a desk), three or four side chairs, and electrical outlets should be provided. In addition, this room may be equipped for "play therapy," a collection of techniques which is often helpful in gaining an understanding of young children. A securable casework unit with adjustable shelves and sliding panels is desirable for storing such items as puppets, picture books, clay, other building materials, painting materials, checkers, and hammers.

d. The case-study or large-group facility
A number of different situations can call for a multi-purpose room of about 200 square feet which is equipped for group testing and conferences. First, the complexity of factors involved in child behavior demands co-operative effort on the part of teachers, counsellors, school nurses, psychologists, social workers, parents, and others; and these people will need a place to meet. Secondly, some pupils have difficulties in adjustment when they move to a new school, enter a new grade, or encounter a new teacher, and such students may benefit from group sessions in the counselling centre. Thirdly, it is necessary at times for the counsellor to administer group tests or to present orientation information to small groups. If the counselling-testing and the counselling-consultation rooms are so designed that they can be combined to enclose 200 square feet, the requirements of a conference room for groups such as these will be satisfied. Table and seating facilities for ten or twelve people will be needed.[22]

e. The reception area
The reception area welcomes all the people who use the guidance services. Parents, children, representatives of community services, teachers, and others will use this area while waiting for appointments or engaging in informal conversation. This room should be sufficiently large to provide the necessary waiting space. It might open into a corridor, foyer, or school entrance lobby. Lounge-type furnishings and a portable adjustable display rack might be so arranged as to produce a relaxed, informal atmosphere. Appropriate use of wall covering, lighting, and furnishings should make the area inviting to passers-by. A minimum area of 80 square feet is recommended.

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[22] It is suggested that this would be most easily obtained by the use of two matching pieces of furniture as tables in the counselling-testing room and the counselling-consultation room These could be pushed together to form a large table when the two rooms are combined

Level	Square Feet	Area	Page Number
K-6	400	Counselling Centre	161

Environmental Criteria

Atmospheric Criteria

			Desirable	Tolerance
Temperature	outside temperature	> 90 F°	78°	± 2°
		< 0 F°	72°	± 2°
Relative Humidity	outside temperature	> 90 F°	50%	± 5%
		< 0 F°	30%	± 5%
Outside Air		CFM per sq ft	0.3 to 0.8	> 0.1
		CFM per person	15 to 30	> 8
Air Changes		per hour	6-8	> 5
Air Movement		velocity: FPM	25 to 40	—
Room Pressure		in. WG	+ 0.10	> + 0.05
Air Filter Efficiency		> 5μ	80%	> 65%
		< 4μ	45% to 80%	—

Odors Body, Smoke

Population	max 10	min 1

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout No	Privacy Yes
Daylight Op'l	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Remarks

Double glazing

Acoustic treatment of floor and ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Consider smoke exhaust	
Other			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System Yes		Clock System Yes	TV Terminal No
Computer Terminal Op'l		Underfloor Duct System No	
Power 110V–1ϕ convenience outlets			
Other			

Notes

Chapter 14
Auxiliary Areas

In this Chapter we shall outline user requirements for four additional parts of the K-6 school, three of which—the administrative centre, the health centre, and the staff lounge—will be enclosed within the building. The fourth section of this Chapter will deal with school grounds—the facilities which surround the building and occupy the remainder of the school site.

The Administrative Centre

School administration is a process that involves co-ordination of all the services which facilitate learning.

The principal is the key figure in the administrative process with the school. His responsibilities include school-and-community relations, school organization, curriculum development, management of the physical facilities and business affairs of the school, and a variety of matters concerning pupils, teaching staff, and non-academic personnel.

The vice-principal assists the principal as second-in-command. His role is often not clearly defined. However, pupil personnel services, the conduct of examinations, co-ordination of curriculum planning, and production of schedules are some of the responsibilities commonly delegated to the vice-principal. Most vice-principals also have teaching assignments, and some assist in counselling and supervision.

In their offices, principal and vice-principal meet pupils, staff, and members of the community individually and in small groups of three or four. There they make and receive many telephone calls, some of which are confidential. There they also dictate, use files and records, and make recommendations and reports. The administrative centre should be planned to facilitate these activities.

The school secretary is frequently a parent's first contact with the school. She answers the questions of parents and pupils, processes reports and records, and acts as liaison among staff, pupils, principal, and the public. She makes, receives, and routes telephone calls. She keeps records concerned with school finances, books, and supplies. Her other responsibilities include maintaining the filing system, duplicating typed materials, taking dictation, sorting and distributing mail, disbursing supplies, and maintaining schedules of assigned responsibilities for teachers and non-academic personnel.[1]

1. User Requirements

a. Space

The administrative area, taken as a whole, serves as the reception area and nerve-centre of the school. As such, its general atmosphere, attractiveness, and efficiency can have a deep impact upon both the outer image and inner workings of the school.

The general office in a K-6 school for 550–825 pupils should be large enough to contain an office for the principal, an office for the vice-principal, a reception area, a secretarial area, and a workroom which will contain storage space for office supplies. The way in which the overall space is distributed among these various areas should facilitate purposeful communication and motion. It is recommended that about 900 square feet be allocated for the general office.

A conference room will be used frequently, as school and community programs expand, for committee work and small group conferences. It is, therefore, desirable to have a small conference room where eight to ten people can hold consultations or meetings. An allocation of about 150 square feet is recommended.

b. Location

The administrative centre should be easily accessible both to school personnel and to visitors. It has functional affinities with other facilities, especially with the main entrance, counselling centre, health centre, and staff lounge, and these interrelationships should find expression in its location. The fact that it may often be used at times when the rest of the building is closed makes a main-floor location desirable. Finally, the location of the suite should permit its later expansion in at least one direction.

The conference room which forms part of the administrative suite is a space which will perform a multiplicity of functions. It should therefore be possible to reach the conference room from the general office, the counselling centre, or the health centre without interfering with school procedures. If possible, the conference room should be located next to the principal's office.

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[1] California State Department of Education, "Scope of Secretarial Work" (Bulletin 27; Sacramento, Calif., California State Department of Education, 1958), quoted in Lowell G.Keith, S.Robert Infelise, George J.Perazzo, *Guide for Elementary School Administration* (Belmont, California Wadsworth Publishing Company, 1965), p 57.

If the conference room were close to the counselling centre, the counselling staff would probably find it useful.

c. The general office—internal space arrangements and general atmosphere

There should be a smooth flow of traffic within the various areas of the administrative suite. Visitors should be able to move from the reception area into the office of the principal or vice-principal or into the conference room without passing through the secretarial area or the workroom storage area.

The reception and secretarial area is a show window for the school and, as such, should create an impression of warmth and friendliness. A comfortable, relaxed, and aesthetically pleasing setting, with a cheerful and attractive blending of colors and ample lighting, should be provided. Three or four lounge chairs, a low table for school yearbooks, magazines, or journals, and wall space for displays constitute essential furnishings. There should be easy access to the secretarial area, the administrators' offices, the conference room, washrooms, and the main school entrance. The number of visitors, staff members, and pupils who might normally use the area at one time should be considered.

The reception area should be marked off from the secretarial area by a counter. This counter should not be so high as to inhibit discussion between the secretary and the smallest child in the school, but it should nevertheless create some feeling of separation between the two areas. This divider might also serve as a storage unit for secretarial supplies.

The school secretary needs facilities for typing, record keeping, and other clerical work. A secretarial desk and typewriter, a work table, an office chair or two, filing cabinets, an intercommunication system, an outside telephone, and a house telephone are essential. The area should have ample lighting and cheerful, harmonious decoration. If there is an assistant secretary, more space and equipment will be needed.

The secretary's office area should serve as the school's communications and data storage centre. It is here that teachers' mail and other messages are received and distributed. It is here, generally, that the school's intercommunication facilities are located—facilities that are used for administrative and supervisory announcements, paging, and selective distribution to class groups of a variety of in-school broadcasts.
It is here, also, that the school keeps vital statistics, academic progress charts, and personality profiles.
For such records, securable fireproof storage, casework, and mobile cabinets should be provided.
If an automated storage and retrieval system or microfilming is planned, special furniture and casework arrangements may be necessary.[2]
The possibility that such data would be stored at some central location off the school premises should also be considered.

For the space which houses both reception and secretarial functions, a total area of about 300 square feet is suggested.

The workroom-storage area for the school secretary will probably call for a separate, enclosed place for duplicating typed materials and assembling pages of duplicated announcements, memoranda, etc.
This room should be readily accessible from the secretarial area. It should be well lighted and well ventilated, and its acoustical treatment should keep the sound of the duplicating process from disturbing other users of the administrative suite. The same room will generally be used for storing general office supplies. Important equipment items are worktables for duplicating machines and for assembling finished work, and shelving for duplicating and other office supplies. About 80 square feet of floor area should be adequate.[3]

The principal's office needs acoustical privacy.
It also should provide ready access to school records, to the school's public address system, and to the secretarial area.

In its decorations and furnishing, the principal's office should reflect the leadership role of its occupant. It should have good ventilation and glare-free lighting at acceptable contrast levels. Furniture and accessories should be a blend of what is appropriate for a private study and what is suitable for an executive office. The general atmosphere should be pleasant and reassuring.[4]

Furniture and equipment for the principal's office will generally consist of a desk unit with good filing and book storage facilities, a comfortable swivel chair, a few lounge chairs (or one lounge chair and a sofa), an outside telephone, a house telephone, and one or two decorative items such as paintings. Windows that give a sense of openness without sacrificing privacy are desirable. A floor area of about 150 square feet is recommended.

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[2] A comprehensive review of available automated information systems is given in Donald D.Bushness (ed.), *The Automation of School Information Systems* (Washington, D.C.: National Education Association, Department of Audiovisual Instruction, 1964).

[3] Procedures for handling academic supplies such as textbooks and bulk stationery vary from school board to school board. Architects should study these practices and discuss storage needs with local educators. Allocated to this function is a total area of about 375 square feet, which may be used for one or several storage rooms, depending upon the number of storeys in the building. In any case, such storage facilities should consist of rooms whose perimeters are lined with open, adjustable shelving units. Where a storage area is large enough, additional units may be used.

[4] Russel E.Wilson and James R.Hood, "Equipment for the Elementary School," *The National Elementary Principal*, XXXIX (September, 1959), 147.

The vice-principal's office requirements will depend on the way in which his duties are defined by the principal. The location, area, and equipment needed for a vice-principal's office will therefore vary with the kind and amount of work delegated to him. Generally, however, a vice-principal's office should have a desk and chair, an outside telephone, a house telephone, comfortable seating for two or three visitors, a securable file cabinet, and some shelving for professional books and periodicals.

In atmosphere, the vice-principal's office should be similar to the principal's. An area of approximately 125 square feet is recommended.

d. The conference room: its atmosphere and furnishings

The conference room should promote cheerfulness, a direct approach to problems, and a free exchange of opinions. Furnishings should include a conference-height table or tables, comfortable chairs, writing and display boards, and electrical outlets. Good ventilation and lighting are essential.

The Health Centre

In today's schools, there is much stress on maximization of the unique potential of the "total child." There is also emphasis on health as one important precondition of such maximization.[5] The World Health Organization's constitution defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity."[6] The Ontario Medical Association takes a similarly broad view. "In speaking of 'health'," say the doctors, "we refer to intellectual, emotional, and social well-being as well as to physical health."[7] Health, then, is a relative thing and something in which a community can always strive to improve.[8]

Since health is closely bound up with the more general aims of the community and its schools, and since elementary schools are the only institutions which serve virtually all children for a considerable period, it seems reasonable that the elementary schools should accept some responsibility for the health of its children. This *is* being done—in two ways: (1) through its program of health education, and (2) through its program of health services.

Health education and health services are most effective where they are closely interrelated.[9] For maximum effectiveness, the teaching about health that takes place in the classroom[10, 11] should be co-ordinated with the activities of a clinical or semi-clinical nature that take place in the health centre. Co-ordination is also an important factor in community planning for improved health. Schools and public health authorities should plan co-operatively for comprehensive health services which include detection, correction, and follow-up procedures. These should begin early and continue on a regular basis throughout the life of the child.

1. Scope of School Health Services

However interesting it may be to consider the interrelationships of the school health centre, community health services, and classroom health instruction, our primary concern here is with the centre itself and with the specific services which it must accommodate. At present, emphasis in the centre is on appraisal, health counselling and follow-up, prevention and control of communicable diseases, dealing with sickness or injury on an emergency level, attention to environmental sanitation and safety, health supervision of pupils participating in physical education and athletics, and assistance in maintaining the health of school personnel.[12] Planning for the health care and education of handicapped children is still another dimension.[13]

[5] Forrest E.Conner, "Focus on Health," *Journal of School Health*, XXXVII (January, 1967), 2.

[6] Eyvind S.Tew (ed.), *Yearbook of International Organizations*, (11th ed. [1966-67]; Brussels: Union of International Associations, 1966), p. 988.

[7] "Brief submitted to the Committee on the Aims and Objectives of Education in the Schools of Ontario by the Ontario Medical Association." (Ontario Medical Association, Toronto, October, 1965), p. 2. (Mimeographed.) Cited hereafter as OMA brief

[8] John R.Life, "Some Thoughts on the Curriculum in School Health Education," *Canadian Association of Health, Physical Education and Recreation Journal*, XXXII (August—September, 1966), 38.

[9] M V.Hamburg, "Working with Community Agencies on School Health Program," *Journal of School Health*, XXXVI (December, 1966), 491

[10] The Ontario Department of Education is concerned that through health education all children should be influenced "to adopt the principles and practices of healthful living as a natural part of . . everyday life." (Ontario Department of Education, *Health Education, Intermediate Division*, [Toronto Ontario Department of Education, 1966], p 20.)

[11] See OMA Brief, pp. 5-12, for an outline of the kind of health education curriculum Ontario doctors would like to see in K-6 schools. The Brief recommends, among other things, (1) co-operation of OMA members in preparation of texts and other materials, (2) use of persons trained in medicine, nursing, and psychology as health education instructors in Grades 1-6, (3) specific course content for kindergarten, the primary grades, and the junior grades, (4) close liaison between the school and the family physician, (5) sex education at the junior level (6) optional puberty-preparation courses, requiring parental consent, at the junior level, and (7) adult education classes designed to assist parents in preparing children for puberty

[12] Charles C Wilson (ed), *School Health Services*, (2nd ed , Washington, D.C. National Education Association and the American Medical Association, 1964), pp. 4-7

[13] Olive E.Byrd (ed.), *School Health Sourcebook* (Stanford, Calif Stanford University Press, 1955), p. 2.

The health centre is the focal point of school health services. Here, physician, dentist, school nutritionist, school nurse, nurse's aid, immunization team, and other consultants undertake the many activities required to "help prevent, eliminate or minimize health problems that delay or hinder learning."[14] Some typical activities are

(a) making individual and group health appraisals, including height and weight measures, dental checkups, and visual and aural screenings;
(b) providing medical or dental treatment (the latter in some schools only);
(c) dispensing first aid and immunizations;
(d) isolating (on a short-term basis) pupils who are ill or who need rest;
(e) counselling pupils and teachers on aspects of health, individually and in small groups;
(f) maintaining records; and
(g) making reports and referrals.

2. *General User Requirements*

Minimum specifications for the health centre are laid down by local and provincial health departments.[15] Architects should study these, along with existing and projected enrolments, neighborhood characteristics, and the extent and character of other health services available in the community. The following guidelines will permit a variety of arrangements for providing school health services for approximately 550–825 children in an elementary (K-6) school.

a. Location

Toronto's Department of Public Health requires that the health centre be situated on the main floor.[16] Since attendance and other problems often have a health dimension, and since health records are needed by counsellors and administrators, it is desirable that the health centre be located near the general office[17] and the counselling centre.[18] The health centre should be easily accessible at all times to visiting parents, to consultants, and to pupils. It should be placed in as quiet a part of the building as possible.[19]

b. Space

It is suggested that a floor area of approximately 450 square feet should be allocated to the health centre and that this should be divided into the following units:

health examination centre	275 sq. ft.
waiting room	100 sq. ft.
rest area	50 sq. ft.
washroom	25 sq. ft.

c. User requirements in specific areas

The health centre, as a whole, should have a cheerful and informal atmosphere. It should suggest health, not sickness. Moreover, the services performed there should be seen as part of the overall educational program of the school and should constitute a part of the child's educational experience. The fact that the centre is devoted to *school health* should be indicated by the name on the door and by the general impression presented to users.

The health examination centre should include space for the nurse's desk, a desk for the nurse's assistant (if there is one), a desk for the doctor, some chairs for visitors, and a screened-off dressing area containing a chair, a mirror, and facilities for hanging clothes. There must also be accommodation for storage of records, instruments, and supplies such as posters and stationery. Shelving for this purpose should be adjustable, and files should be fitted with locks. It may be desirable to put the doctor's desk and chair and one or two visitor's chairs in an area partitioned off by means of some or all of these storage units. If this is done, the cabinet containing the doctor's instruments and supplies should face into this partitioned area. If the suggested partitioning is not done, this cabinet should, in any case, be placed near the doctor's desk. If possible, the dressing cubicle should be near the part of the room occupied by the doctor.

The examination centre should be well lighted and well ventilated. It should be furnished in a style which does not suggest a hospital atmosphere. A few comfortable chairs, a couch, a typewriter, facilities for weighing and measuring children, a washbasin, a space for first aid supplies and sterilization, plus electrical and telephone outlets constitute essential equipment.

Various arrangements of internal space may prove workable, provided only that there must be 20 unobstructed running feet between an adjustable eye chart and a space in which a child can be placed during an examination for visual acuity. The eye chart should have an illumination of 50 foot-candles, and it should be free from glare and shadows.

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[14] 1966 Annual Statement, City of Toronto Department of Public Health, 1967, p. 93. (Mimeographed.)

[15] See "Minimum Specifications for a Health Service Room," (Department of Public Health, City of Toronto, 1964.) (Mimeographed.) See also, Ontario Department of Education, *Suggestions for the Layout and Construction of Schools in Ontario* (3rd ed.; Toronto: Ontario Department of Education, 1962), art. 207.

[16] Department of Public Health, City of Toronto, *op. cit.*, p. 1.

[17] Ontario Department of Education, *op. cit.*, art. 207.

[18] R.E.Ratcliff, "Planning a Health Service Unit," *Journal of School Health*, XXXVI (December 1966), 512.

[19] Alma Nemir, *The School Health Program* (Philadelphia: W.B Saunders Company, 1965), p. 255.

The health examination centre is a single unit. Although it should be directly accessible through doors from the waiting room, the rest area, and the washroom, the centre should be constructed to ensure visual and acoustic privacy for its users.

Facilities for dental work are provided in some schools. Policies for dental treatment of elementary school children vary considerably among the local school boards. The trend, specially in Toronto, seems to be toward providing dental services in selected elementary schools on a "regional basis"—that is, in such a way as to serve a number of neighboring schools in one location.

If an elementary school is to have a dental suite, this facility should be adjacent to the health centre or form a part of it. A properly equipped dental chair, special storage for X-ray plates, counter shelving with a wash basin, an office desk, two or three chairs, electrical provision for a portable X-ray unit, and a number of electric outlets are required. The dental suite can share a common waiting area with the health centre, provided this area is enlarged.

If a health centre has provision for dental services, the total area required will, of course, be greater than the 450 square feet we have recommended for a health centre.

The waiting room should be able to accommodate about eight persons. (A bigger one may tend to attract and to hold pupils longer than necessary.) It should be equipped with a bench, three or four chairs, a low table for magazines and other reading materials, and adequate bulletin board space. Proximity to a washroom is desirable.

There should be direct access to the health examination room through a door. A large window opening into the corridor is a supervisory aid. An area of 75 to 100 square feet is recommended.

The rest area is not a "sick bay." It is a place where one or two pupils can rest under supervision without being disturbed. It should be directly accessible to the health examination room and the washroom. A bed-sized couch, a comfortable lounge chair, good ventilation, and lighting conducive to relaxation are needed. An area of about 50 square feet is recommended.

In some schools it may be necessary to provide rest area accommodation for more than one person.

The washroom must be easily accessible from the rest area, the waiting area, and the health examination centre. It should contain a toilet and a basin unit. Approximately 25 square feet of space will serve for this purpose.

The Staff Lounge

A pleasant place to relax and visit is essential for an elementary school staff. The lounge area serves as an adult preserve to which staff can retreat. Here, if they wish to do so, teachers can temporarily free themselves of the demands of the teacher role.

The staff lounge may be used for many different purposes. Included among these are eating lunch, relaxing during breaks, visiting before and after hours, holding semi-formal staff or professional meetings, entertaining visitors, and holding meetings of the Home and School executive or similar groups.

The only educational trend likely to affect desirable space allotments and furnishings for this auxiliary space would be an increase in staff size and in the number of persons irregularly present in the school. Staff size will probably continue to increase as the pupil-teacher ratio is decreased, and as more specialists, counsellors, lay assistants, and technicians are employed. The number of interns, consultants, co-ordinators, and others who work occassionally within the school is likely to increase. Probably, also, the number of parents and other visitors will grow as their leisure time increases and as school-community separation is decreased. Allotments of space and furnishings for the staff lounge might be increased to accommodate these extra people as the need becomes apparent. Space allotment is sufficient for the lounge function when users do not feel crowded.

In many schools, the staff lounge has also been used as instructional space or as a staff preparation area. While these practices will probably be continued in some situations, the area should be planned without regard to them. If the room is to serve for the mental and physical restoration of staff, it must be designed as an adult setting, free of signs of routine work and of the demands of children.

1. Location

The staff lounge should be easily accessible from all parts of the school. It should be close to staff washrooms, but the washrooms should not open directly off the lounge. If possible, the lounge should adjoin the kitchen in the general purpose area.

2. Furnishings and Equipment

A dining area with sufficient tables and chairs should be provided to allow the staff and a few visitors to eat at one time. Lounge chairs and sofas sufficient to seat the staff, plus appropriate low tables, constitute basic furnishings for the rest of the area. Other items might be a bulletin board, magazine rack, bookcase, radio-record player, and a TV set.

If the general purpose area kitchen is not contiguous, the staff lounge should have a small kitchenette. Such a kitchenette (or vending machines) should adjoin the dining area but be visually cut off from the lounge area. A small stove or hot plates, a refrigerator, a sink with hot and cold water, a counter and cupboards for cutlery, crockery, and dry goods storage will constitute the necessary equipment.

3. Environment

The room should be quiet, comfortable, and conducive to relaxation and sociability. Design and decoration should be tasteful in a casual sense. The room and its furnishing should be designed as a whole; furnishings should not result from a series of accidental purchases or windfalls. Windows are desirable for visual diversion and a sense of spaciousness. Lighting should be domestic rather than institutional. The overall quality of the room should reflect the tastes of its users.

The School Grounds

Traditionally, elementary school sites have been small and poorly developed. Little connection was seen between them and the school curriculum. Primarily, they were thought of as space where the school children might assemble, to which they could be dismissed, and where they could spend recess periods in the open air.[20] Although many better school sites had baseball diamonds and soccer pitches that were used for extra-curricular games and occasional physical education exercises, little or no thought was given to developing play centres, natural science areas, or an organized games complex. Frequently sites were poorly drained and spasmodically graded. Few were attractively landscaped.

Elementary school sites were often stark, unappealing places that discouraged rather than excited a child's imaginative in-school or after-school play. They tacitly exhibited the school administrator's lack of interest in the importance of childhood play and his concept of the school as an entity apart from the community.

Recently, however, the school site's potential as a valuable educational tool has begun to be appreciated. Teachers who look upon the school site as an extension of inner-school facilities often take their pupils outside to explore, investigate, and discover stimulating aspects of the world. And with the recognition that play activities exert an important influence on a child's physical, social, and intellectual development, interest in carefully designed on-site play centres is increasing.

1. The Site in Relation to the School Program

For the school site to render maximum service to the school program,[21] it is necessary for the educator to describe explicitly to the architect (and perhaps to a landscape designer) those educational practices and probable community uses that could affect site design.

a. Outdoor education

This topic is commanding considerable interest among teachers who endorse the experience-oriented elementary school program. Where possible, school sites should be located contiguous to existing or planned conservation areas, playgrounds, or other community open spaces that could be used to awaken interest in the outdoors and accommodate an expanded outdoor program. Such a program can promote integration of many curriculum areas such as physical education, science, art, and social studies and can offer additional opportunities for social development. When such a location is not feasible, special care should be exercised to create and/or preserve natural beauty at the school site.

Consideration should be given to providing a garden at schools where there is space, if the educator considers this a workable idea. The garden, which might be fenced and might include a small greenhouse and cold frame, would be used to kindle an interest in natural science, horticulture, and agriculture. (Pupils' garden tools could be stored either adjacent to the caretaker's outdoor implements or in the general purpose room's outdoor equipment storage area.)

b. Physical education

In the elementary school, the physical growth and activities of the children vary according to age.

Young children are self-centred and individualistic in their activities, while older children often engage in group and team activities. Walking, running, jumping, pulling, bouncing, throwing, climbing, swinging, digging, and imaginative play are common activities for children in the kindergarten and the primary grades.[22] Their relatively short interest span produces frequent changes in play patterns.

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[20] W.W.Butchart, "The School Site," *Proceedings, National Conference on School Architecture* (Banff, Alta., 1962), p. 23.

[21] Ontario Department of Education, *op. cit.*, p. 24.

In the later elementary school grades, longer periods of play involvement are evident. At this time, baseball, soccer, volleyball, basketball, field hockey, and other team games gain in appeal.

Childhood activities of many kinds are incorporated into the outdoor physical education program of the elementary school. School site plans must therefore facilitate them.

c. Provision for play

The most desirable play materials and facilities are those which encourage spontaneous and imaginative activity. Play sculpture, sand pits, climbing apparatus, large cement tiles, and big wooden building blocks are examples. Each of these requires an area sufficient to allow proper use of the equipment without disruption of any one activity by any other. A soft surface such as sod is recommended for these areas. Where heavy ground surface wear is expected, a specially resilient type of paving might be used. Although each area might be partitioned and partly secluded by shrubbery or trees, teacher surveillance should be possible.

A baseball diamond with backstop, a soccer pitch, and a place for field hockey are desirable play areas that will use generally the same space. These areas lend themselves to sod surfaces; when this is not possible, lined asphalt surfaces may suffice. Although baseball diamonds and soccer pitches are of some importance for team games, it is more essential to have space where many smaller groups of children can play a type of choose-up kickball, baseball, or field hockey in a more informal way.

Activities like skipping, jumping, hopscotch, and ball bouncing are suited to hard-surfaced areas adjacent to the walls of the building. In designing the school, the architect might provide a wall, suitably related to the paving and landscaping, for ball play. Volleyball and basketball courts might be lined on a hard flat surface, perhaps in the same area if space is limited, adjacent to the outside storage room of the school.[23]

Free-for-all games such as tag, chase, or red rover may be played in any open space, either on sod or on some hard surface. Because it is used for limited periods, a track and field area might very well share the space used for baseball, kickball, or field hockey. The amount and variety of the play facilities should allow full pupil participation without undue competition for use. Play materials and equipment should be sturdy, durable, and free from all safety hazards such as rough or sharp surfaces and protruding edges. Because many creative play materials will have attractions for all children in Grades 1 to 6, their play area should *not* be divided into space for various age groups, but rather in accord with the function, movement, and distinct nature of the play activity.

d. The kindergarten area

Kindergarten play areas are described in Chapter 9 of this Report. Such facilities are usually fenced or hedged off from the main playground and should have separate paths and entrances. The kindergarten play area should be adjacent to a school entrance which serves the kindergarten alone.

2. Planning Ancillary Site Features

Since site space is at a premium, it is necessary to co-ordinate all the functions of the grounds in such a way as to be educationally desirable yet economical to maintain. Well integrated ancillary features, such as service roads, parking areas, and fences, contribute significantly to the realization of this aim.

a. Surface materials

Parking lots, bus loading areas, school service roads, and entrance ways should be covered with a hard, durable, and easily maintained material such as concrete or blacktop. A large area around all pedestrian entrances and surrounding much of the school building should also be covered with the same kind of material. As previously indicated, some of this area will be suitable for play activities such as volleyball, skipping, and rope jumping. Where foundation plantings, lawns, trees, or gardens are placed near the school building, they should be separated from hard-surfaced areas by curbs.[24]

b. Entrance roads

Surfaces intended for motorized traffic should be removed from children's walkways, entrances, and play areas. They should be wide enough to allow safe, convenient manoeuvring of large equipment such as trucks and snowploughs.

c. Service areas

Trucks or cars transporting goods and services to the school should occupy space which is well removed from pupil entrances, walkways, and playgrounds. Service areas should be easily accessible to entrance roads and not far from the street. They should be large enough to facilitate the movement of all vehicles servicing or supplying the school, and they should permit off-street loading and unloading of these vehicles.

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[22] *Ibid.*, p. 25.

[23] W. P. Pasternak, "Orientation and Adaption," *Proceedings, National Conference on School Architecture* (Banff, Alta., 1962), p. 39.

[24] U.S. Department of Health, Education and Welfare, *School Sites Selection, Development and Utilization* (Washington: U.S. Department of Health, Education and Welfare, 1958).

d. Parking areas
A sufficient number of parking spaces should be provided to accommodate the maximum number of staff members who will ultimately work at the school. These spaces should be easily accessible from the street and close to the school building. They should not interfere with the safe movement and activities of the pupils. Cars of professional and business people who visit the school can be accommodated in places left free by non-driving staff members. Although land prices may make this unrealistic in many Metro locations, it might be desirable to have extra spaces for cars of visiting parents.

e. Student entrances and pedestrian walks
Sufficient pupil entrances should be provided to allow easy, safe access to the site from all sections of the area served. Design of school approaches and entrances should allow public surveillance of unattended small children. Walkways should be slip-free and, if possible, free of steps and other sudden changes in grade.

f. Bicycle racks
These are in great demand at some schools, rarely used at others. A needs survey prior to construction would therefore be advisable. If bicycle racks are provided, they should be placed near the school building where they can be watched. They should be close to the play area, but should present no safety hazard to children using the area. Where the school building divides the play area, it may be desirable to have two bicycle racks.

g. Bus loading area
There are fewer bus loading areas in Metro schools today than in the past; but where these areas are needed, they should be spacious enough to allow groups of waiting students to stand safely without spilling out into the road or garden areas. The bus loading area should be so designed and located as to avoid any threat to the safety or limitation of the activities of students not using buses.

h. Fencing and screening
Proximity to private property, nearness to streets or other potentially hazardous areas, and the nature of game activity will determine the strength and height of fencing or screening needed. Fences and/or hedges should be attractive, easily maintained, and durable.

i. Washroom facilities
It is extremely desirable to have washroom facilities for each sex and a drinking fountain just inside the school, close to entrances and major play areas.

j. Exterior lighting
Adequate lighting is desirable for all school entrances and for all other areas adjacent to the building which require light for pedestrian safety before and after evening functions, for safe dismissal of pupils during dark winter days, and as a deterrent to vandals. Such lighting also enables the building's exterior architectural features to be seen and appreciated at night.

3. Some Final Considerations

Although children are usually active in the playground, they sometimes wish to sit and rest or talk. Some simple but sturdily built seating should be provided, preferably near the building or close to the garden area. Such seating should be designed as part of the landscape plan.

Tree planting should be a mandatory feature of all school site development. The larger forest species should be chosen to ensure a pleasant setting for the school, particularly in treeless subdivisions.

In addition to being neat, clean, dry, and well-ordered, grounds should be free of safety hazards either natural or man-made. The architecture of the school, the landscaping of the grounds, and the color and design of playground facilities should blend to create an attractive outdoor setting,[25] and to set an example of good taste for users of the school and for the community.

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[25] *Ibid.*, pp. 76-77.

Level	Square Feet	Area	Page Number
K-6	550 ± see remarks	General Office	171

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	outside temperature < 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	outside temperature < 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	± 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	—
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—
Odors			

Population	max 25	min —

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	PA console	—	
	Business mach.	—	

Remarks

Area of 550 sq ft includes areas for waiting and reception.

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In Yes	Blackout No	Privacy No
Daylight Op'l	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level			77		

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System Yes	
Power 110V–1ϕ for office machines			
Other Fire alarm, Master clock, PA rack, Annunciator			

Remarks

Notes

Level	Square Feet	Area	Page Number
K-6	125 to 150	Private Office	173

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature outside temperature	> 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity outside temperature	> 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.15
	CFM per person	15 to 30	> 15
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	—
Room Pressure	in. WG	+ 0.10	> + 0.05
Air Filter Efficiency	> 5 μ	80%	> 65%
	< 4 μ	45% to 80%	—

Odors Smoke

Population	max 4	min

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	

Remarks

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout No	Privacy Yes
Daylight Op'l	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		
Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Acoustic treatment of floor and ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Consider smoke exhaust	
Other			

Electrical Services

PA Yes	Intercom Yes*	Handset Yes	Bell Tel Yes
Program System Yes		Clock System Yes	TV Terminal Yes
Computer Terminal Yes		Underfloor Duct System No	
Power 110V–1ϕ convenience outlets			
Other			

Remarks

*Desk set and microphone

Notes

Level	Square Feet	Area	Page Number
K-6	175	Conference Room	175

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance	Remarks
Temperature	outside temperature > 90 F°	78°	± 2°	
	outside temperature < 0 F°	72°	± 2°	
Relative Humidity	outside temperature > 90 F°	50%	± 5%	
	outside temperature < 0 F°	30%	± 5%	
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2	
	CFM per person	15 to 50	> 15	
Air Changes	per hour	6 to 8	> 5	
Air Movement	velocity: FPM	25 to 40	—	
Room Pressure	in. WG	+ 0.10 to − 0.10*	> + 0.05	*When smoke exhaust is operating
Air Filter Efficiency	> 5 μ	80%	> 65%	
	< 4 μ	45% to 80%	—	

Odors Smoke

Population	max 12	min 0

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment		

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out No	View In No	Blackout Yes	Privacy Yes
Daylight No	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	63	48

Remarks: Acoustic treatment of floor and ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Smoke	
Other			

Electrical Services

PA No	Intercom No	Handset No	Bell Tel No
Program System No		Clock System Yes	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V−1ϕ convenience outlets			
Other			

Remarks

Notes

Level	Square Feet	Area	Page Number
K-6	80	Work & Storage Room	177

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance
Temperature	outside temperature > 90 F°	78°	± 2°
	< 0 F°	72°	± 2°
Relative Humidity	outside temperature > 90 F°	50%	± 5%
	< 0 F°	30%	± 5%
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.1
	CFM per person	15 to 30	> 8
Air Changes	per hour	6 to 8	> 5
Air Movement	velocity: FPM	25 to 40	—
Room Pressure	in. WG	+ 0.05	> 0.00
Air Filter Efficiency	$> 5\mu$	80%	> 65%
	$< 4\mu$	45% to 80%	—

Remarks

Odors Duplicating

Population	max 4	min 0

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	Duplicating	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out No	View In No	Blackout No	Privacy No
Daylight No	Level Control No		

Acoustic Criteria

Ambient Noise Level: NC 40 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			N/A		
	min			N/A		

Generated Noise Level (in db re .0002 dynes/cm^2)	Frequency: cps	31.5	125	500	2000	8000
	design level			N/A		

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain No	Exhaust Depends on duplicating equipment	
Other			

Remarks

Electrical Services

PA No	Intercom No	Handset No	Bell Tel No
Program System No		Clock System No	TV Terminal No
Computer Terminal No		Underfloor Duct System No	
Power 110V–1ϕ for duplicating equipment			
Other			

Notes

Level	Square Feet	Area	Page Number
K-6	450	Health Centre	179

Environmental Criteria

Atmospheric Criteria

			Desirable	Tolerance
Temperature	outside temperature	> 90 F°	78°	± 2°
		< 0 F°	75°	± 2°
Relative Humidity	outside temperature	> 90 F°	50%	± 5%
		< 0 F°	30%	± 5%
Outside Air		CFM per sq ft	0.3 to 0.8	> 0.1
		CFM per person	15 to 30	> 8
Air Changes		per hour	6-8	> 5
Air Movement		velocity: FPM	25 to 40	± 10
Room Pressure		in. WG	− 0.05	< 0.00
Air Filter Efficiency		> 5μ	80%	> 65%
		< 4μ	45% to 80%	—

Odors Body, medicine

Population	max 6	min 1

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	

Remarks

Individual room control is desirable.

Double glazing

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout No*	Privacy Yes
Daylight Op'l	Level Control No		

*Blackout required in eye-testing area

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	46	65	77	77	77

Services

Mechanical Services

CW Yes	HW Yes	Steam No	Gas No
Air No	Drain No	Exhaust No	
Other			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System No		Clock System No	TV Terminal No
Computer Terminal Op'l		Underfloor Duct System No	
Power 110V–1ϕ convenience outlets			
Other			

Notes

Level K-6	Square Feet 850 (see remarks)	Area Staff Lounge	Page Number 181

Environmental Criteria

Atmospheric Criteria

		Desirable	Tolerance	Remarks
Temperature	outside temperature > 90 F°	78°	± 2°	Area of 850 sq ft includes areas for kitchenette and coat storage.
	< 0 F°	72°	± 2°	
Relative Humidity	outside temperature > 90 F°	50%	± 5%	
	< 0 F°	30%	± 5%	
Outside Air	CFM per sq ft	0.3 to 0.8	> 0.2	
	CFM per person	15 to 50	> 15	
Air Changes	per hour	6 to 8	> 5	
Air Movement	velocity: FPM	25 to 40	—	
Room Pressure	in. WG	+ 0.10 or − 0.10*	> + 0.05	*When exhaust fan running
Air Filter Efficiency	> 5μ	80%	> 65%	
	< 4μ	45% to 80%	—	
Odors Body, smoke				If kitchenette not separate—food odors.

Population	max —	min —

Heat Gain	source	watts	BTUH
	Lighting	3 to 4/sq ft	
	AV equipment	—	
	(cooking)	—	

Visual Criteria

Visual Performance Index (VPI) 63.0			Ft Candles N/A
View Out Op'l	View In No	Blackout Yes	Privacy Yes
Daylight Op'l	Level Control Yes		

Acoustic Criteria

Ambient Noise Level: NC 35 max

Reverberation Time (in seconds)	Frequency: cps	125	250	500	1000	2000
	max			1.0		
	min			—		

Generated Noise Level (in db re .0002 dynes/cm²)	Frequency: cps	31.5	125	500	2000	8000
	design level	45	65	77	63	48

Remarks: Acoustic treatment of floor and ceiling is recommended.

Services

Mechanical Services

CW No	HW No	Steam No	Gas No
Air No	Drain No	Exhaust Required if kitchen not enclosed	
Other Consider wardrobe exhaust			

Remarks

Electrical Services

PA Yes	Intercom Yes	Handset Yes	Bell Tel Yes
Program System Yes		Clock System Yes	TV Terminal Op'l
Computer Terminal No		Underfloor Duct System No	
Power 110V—1φ convenience outlets			
Other			

Notes

Chapter 15
Building Services and Service Areas

School buildings must be designed for the population they are to serve—the pupils and their teachers. The school building is an educational facility and must not be warped merely to accommodate maintenance, administration, or any other ancillary use and/or service function. Many services, however, contribute to the proper functioning of the elementary school plant. Selection of services to be provided must be based on an intelligent appraisal of the requirements of pupils and teachers. Such requirements are derived from anticipated academic programs, operating and maintenance procedures and costs, and the total budget for the facility.

Concerning the services for a school building, no decision should be made without the aid of the whole design team: the educator, the educational specification writer, the architect, and his engineers. Educational needs must be clearly stated, requirements determined, and implications studied before members of the design team can produce effectively.

Traditionally, elementary school buildings have been utilized for a period of nine months of the year, and during that period they have been operated for an average of about nine hours a day, five days a week. Technical demands were originally comparatively simple. Buildings were expected to provide shelter from wind, rain, and cold; lighting to dispel the gloom; plus enough heating to make school work possible. Ventilation was achieved in summer by opening windows. In winter this need was met accidentally by drafts that came through door and window frames.

As buildings became more weathertight, some form of mechanically assisted ventilation was required to maintain tolerable oxygen levels and to remove carbon dioxide and body odors. In the past two decades, higher levels of illumination have been demanded and the use of electrically operated equipment has proliferated. The result has been a tremendous heat load within the structure.

The increasing use of electrical energy and the consequent heat dissipation problem appear likely to continue. Moreover, increased use of glass and glass facades in the design of school buildings in the past few years has substantially increased the solar load and greatly complicated the temperature control problem. If comfort levels are to be adequate, careful consideration of mechanical services will be required.

It should be noted that there is no intention here to provide data which normally would be obtained from specialists in the relevant fields. Our purpose is rather to consider the overall effect of services in the preparation of academic specifications and user requirements. We are providing, in a sense, a check list of things to be done, considered, used, and stored.

Climate Control Principles

It may take years of investigation before the degree to which the learning process can be improved by controlled environment is accurately documented. However, many studies have indicated the physically fatiguing influence of environmental extremes and the resulting reduction in efficient performance of the human body, after varying exposure times.[1, 2]

Although the human body is remarkably capable of withstanding wide variations and frequent fluctuations in climatic conditions, it is most comfortable and efficient within a relatively narrow range of conditions.[3] If the body calls on its inner resources to overcome adverse climatic influences, it does so at the expense of distraction, and, ultimately, fatigue and strain.

The primary function of the heat-regulating mechanisms of the human body is to preserve the temperature of its vital organs and deep tissues.[4] Upon being exposed to cold surroundings, the body reacts by increasing its muscular activities. (This is the mechanism of shivering.) Conversely, when external thermal effects tend to raise the inner body temperature above its neutral point of 98.6°F, blood flow to the outer skin surfaces increases. During hot, humid weather, many people are easily fatigued and show a definite disinclination for exertion.[5]

Various tests under controlled laboratory conditions,[6] as well as observations in industry, have indicated

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[1] C.Theodore Larson *et al.*, *SER School Environments Research, SER 1 Environmental Abstracts* (A Project of the Architectural Research Laboratory, University of Michigan; Ann Arbor: University of Michigan, 1965) pp. 204-244. Cited hereafter as SER-1.

[2] American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., *ASHRAE Handbook of Fundamentals* (New York: American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., 1967), pp. 111-124 and associated bibliography. Cited hereafter as ASHRAE 1967.

[3] SER-1, pp. 205-244.

[4] ASHRAE 1967, p. 124 (footnote 7).

[5] ASHRAE 1967, p. 125 (footnote 28).

[6] SER-1, pp. 205 and 210.

that performance and efficiency, as evidenced by accident rates, absenteeism, output, and quality of production[7, 8] are considerably influenced by extremes of heat and cold. Intestinal infections seem to increase in the hot weather, while respiratory infections increase in winter. Minimum mortality rates occur under optimal climatic conditions.

During the school year in Metro Toronto, the outside air temperature varies from −10°F to well over 80°F,[9] winds vary from 0 to 60 miles per hour, most days will have some sunshine, and humidity conditions can vary from saturated to nearly 0 per cent Relative Humidity (RH). Thermal conditions inside a shelter will be affected by outside temperature, sunshine, and wind, and also by internal heat gains due to lighting, machinery, cooking, and heat given off by people. Although our knowledge is incomplete, it is safe to say that concerning a number of atmospheric factors, an interior climate likely to maintain maximum teacher and pupil efficiency will fall within well-defined limits.

1. Space Air Temperature (Dry bulb in °F)

Indoor temperatures are measured between 30" and 60" above floor level. For active occupants in gymnasia or shops, the optimal temperature is 65°F to 70°F. For sedentary occupants of other areas, it is 72°F to 75°F. In areas such as health, change, or shower rooms, provision should be made for increasing the temperature to about 78°F or higher during periods when occupants are not dressed.

Temperature fluctuations should be kept to a minimum, particularly in areas with constant sedentary occupancy. Temperature stratification between floor and ceiling should also be at a minimum. Down draft from windows or other cold surfaces and drafts from cracks around doors or windows should be minimized.

Occupants should be shielded from high-temperature heat sources. Precautions must be taken to avoid having portions of unclad bodies injured by contact with hot surfaces. In some areas, such as kindergartens, children may lie down for extensive periods. To avoid discomfort in such areas, a floor temperature should be maintained that is warm to the touch; but floor warming panels should not have a surface temperature higher than 85°F.

2. Humidity

For comfort, the optimal level of relative humidity in a space is between 30 per cent and 70 per cent,[10] if the "dry bulb" temperature is controlled within close tolerance (plus or minus 1°F). At approximately 50 per cent RH, there appears to be the greatest decay in the growth rate of bacteria.[11, 12] At this same humidity level, mucous membranes of the respiratory system are able to function most effectively, thus reducing incidence of infection and cross-infection. When room ambient temperature reaches 80°F or higher, an increase in humidity over 55 per cent results in increasing discomfort. A relative humidity above 30 per cent, when the outside temperature is below 30°F, can cause condensation in the exterior envelope of the building. To prevent excessive condensation, in winter, on cold surfaces such as windows, double glazing is required. In this geographic region, for outside temperatures below 30°F an interior relative humidity level around 30 per cent is normally regarded as a prudent maximum.

3. Air Movement

The effect of air motion on sedentary occupants in a space is of serious consequence. A space completely void of air movement feels "dead" and has a depressing effect. A steady air motion of 15 to 40 ft./min. is normally desirable. Air motion in excess of 50 ft./min., particularly if coupled with cold air temperature, will create a sensation of "draft." Various portions of the body react differently to "drafts." Thus, a refreshing breeze across the face would cause complaints if directed at the bare neck or ankles.

4. Effective Temperature

"Effective temperature" is a single-value index, combining the effects of space temperature (dry bulb °F), humidity, and air motion on the sensation of warmth or cold felt by the human body. Figure 2 gives an indication of effective temperature producing identical sensations for various combinations of space temperatures and humidity ratios, at a specified air movement.

The original effective temperature chart, produced by ASHRAE, was based on statistical analysis of people's reactions to entering thermally controlled rooms from non-controlled spaces. Later research (shown by four vertical lines labelled "slightly cool," "comfortable," "slightly warm," and "warm" in Figure 2) seems to indicate a need for higher effective temperatures for people exposed to conditioned space for extended periods, i.e., around three hours.

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[7] *Ibid.*, pp. 245-361.

[8] ASHRAE 1967, p. 125 (footnote 47).

[9] See Figure 1, p. 195.

[10] See Figure 2, p. 196.

[11] K.H.Kingdon, "Relative Humidity and Airborne Infection", *American Review of Respiratory Diseases*, LXXXI (1960), 504.

[12] Fifty per cent RH kills germs. See *Heating and Ventilating* XLVI (1949), 67.

There is a need for extensive research and field observation of physiological and psychological responses to various and varying controlled conditions in school spaces, with particular attention to length of occupancy, type of activities, and disposition of radiating and re-radiating panels.

5. Radiant Effect

The effect of radiation of the surroundings and the human body must also be considered. A reduction of 1°F in effective temperature can be compensated for by a 3°F rise in the mean of radiant temperatures of surrounding surfaces, and vice versa.
For optimal comfort the average of surface temperatures of the building envelope should not differ appreciably from the average temperature of the air in the space. Floor temperatures should not exceed 85°F for prolonged occupancy. High temperature of ceiling in close proximity to occupants' heads can lead to discomfort.

The body is a source of radiant energy. When large numbers of people assemble in the same space, the effective temperature must be lowered in proportion to the density to maintain comfort.

6. Air Purity

For ordinary occupancy it is desirable to introduce sufficient odor-free air to replenish the oxygen and to keep CO_2 to a health minimum. To do this 4 CFM per pupil are required.[13] But to maintain a "fresh" atmosphere and reduce distraction requires 10 to 15 CFM outside air per pupil in a space of 220 cu. ft. per pupil.[14]

Odor dilution is a function of space volume, number of occupants, their living habits (food and cleanliness), total rate of air change, amount and quality of outside air introduced, and quality of air supplied to the room. The olfactory senses of the body react only for a short period and quickly become immune.

To provide odor removal, absorbent materials can be placed in the air stream. (For example, activated charcoal, if its pores are free, will absorb a considerable amount of odor and can be a useful supplement in the treatment of odor-laden air.)

It is desirable to have a slightly negative pressure in rooms where odors are produced, such as change and shower rooms, washrooms, science rooms, or in places where cooking is done.

Sufficient outside air must be introduced, by controlled means, into the space to prevent uncontrolled infiltration, through cracks in the porous building envelope, which would result in drafts.

To reduce the chance of smoke filling passages or corridors during a fire, the Ontario Fire Marshal's requirements call for a positive pressure in these areas.

In areas where considerable smoking may occur, such as conference rooms, there should be provision for smoke removal.

Lack of sufficient outdoor air becomes particularly objectionable if coupled with inadequate temperature control or insufficient total air movement.
To prevent sensations of stuffiness, total air change within a room should take place once every ten minutes. Since every 1,000 CFM of outside air is equivalent to the heating and cooling load of the average six-room bungalow, economy dictates prudent selection of ventilation rates. The quantity of outside air as a proportion of the total air should be considered in relation to the type of filtration, dehumidification, air washing, absorption, masking, or dilution provided to the air handled. A designer's choice of air quantity under peak design conditions must be the result of careful evaluation of first cost, operational cost of heating and cooling plant, filtration against nuisance, and free performance.

The location of outside air inlets and exhausts can affect air quantity and air purity. Inlets and exhausts should not be located where there is likelihood of blockage by dirt or snow. The possibility of short circuiting (intaking air directly from the building exhaust) should be prevented in locating the air inlets and exhausts. The air intake should be located to avoid drawing air from obvious sources of pollution—chimneys, incinerator flues, heavy traffic arteries, or exhausts from neighboring buildings. On sites where air pollution is severe, an ordinary ventilation system cannot provide satisfactory air quality.

Much attention is being paid today to the selection and use of filtering systems. Average atmospheric dust consists of approximately 80 per cent by weight of particles larger than 5 microns.[15] But the number of particles smaller than 4 microns is 600 times that of the larger particles. The small particles include bacteria, viruses, and particles responsible for most visible smudging. A coarse type of household furnace filter will remove 75 per cent of the larger particles, but only about 10 per cent of the finer particles. Highly efficient filtration of up to 98 per cent can be obtained with electronic cleaners or deep-bed fibrous materials. To extend their life span and reduce maintenance and operational costs, high-efficiency filters are normally preceded by cheaper coarse-type filters which remove large particles.

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[13] ASHRAE 1967, p. 124 (footnote 1).

[14] ASHRAE 1967, p 468 (Table 1).

[15] A micron (a unit of length) is the thousandth part of one mm or the millionth of a metre. The length referred to is the diameter of the particles

The established testing procedure to determine the efficiency of filters in removing fine particles is an optical comparison with accepted standards of darkness of test filters, after use.

7. *Acoustical Problems*

During the planning stage, there should be careful analysis of sound transmission and vibration from mechanical equipment such as fans, pumps, boilers, and motors as well as of noise transmission between areas through open ducting. Provision should be made to prevent transmission of noises generated and also to prevent cross-talk transmission. The latter is particularly important between adjacent washrooms, offices, teaching areas, music room, and library materials centre.

8. *Controls*

Location and type of controls must be evaluated. A pre-selection of room temperature with possible adjustment by caretakers will probably be applicable for most locations. However, multi-purpose areas such as the general purpose room and the health room may require adjustment of temperature at particular times. If delicate temperature sensing devices are located in traffic, gymnasium, or shop areas, they require guards.

Control of operating costs may require central temperature reset devices to allow night or week-end temperature set-backs with quick warm-up capability in the mornings before classes.

9. *The Structure and its Effects*

The effect of the structural envelope on its occupants and the air is significant. Heat is transmitted by conduction, convection, or radiation. Glass acts as a poor insulator (good conductor of heat flow in or out of structure). At the same time, it presents little impediment to the passage of radiant heat from the sun. Lightweight structures will provide little thermal inertia, thus allowing, on a time basis, little heat retention or storage of cooling effect. Radiant interchange between occupants and surrounding surfaces makes an important contribution to the comfort of the occupants. In a geographical area that can have outside temperatures of 0°F or lower, the structural envelope must be designed and constructed to prevent condensation within it or on it, since building materials and finishes may be damaged by condensation or freezing of the condensate.

Due to the requirements of the Ontario Fire Marshal, the structure, particularly in multi-storey buildings, must be fire-proof. If integration of functions is contemplated (e.g., the use of plenums in lieu of ducts), the Fire Marshal's evaluation of fire hazards and fire spread must be taken into account.

A comparison of (+) heat gains from occupants and lighting against (−) conduction heat losses through the structural envelope indicates that most schools, when occupied, require heat removal during most days in nearly all spaces. The introduction of large glass areas facing east, south, or west will result in wide variation in heat balance during a typical winter day. In the morning heat pickup will be required, while a cooling period will be needed during the latter part of the day. When the outside air temperature rises above 55° or 60°F, most occupied areas will require artificial cooling to maintain a heat balance within a healthy, comfortable thermal range around 75°F.

10. *Selection of Heating Media*

The media available for conveying heat are hot water, steam, air, electricity, or various combinations of these. They function in conjunction with a heat generator and exposed or concealed radiation; floor, wall, or ceiling radiant panels; ducts with grills or diffusers or air supply system; or in unitary supply systems. Selection of a medium depends on requirements for sophistication, degree of control, speed of response, warm-up capacity, necessity for complete night and weekend shutdown or temperature reduction, chances of freeze-up, and operating fuel and maintenance costs related to use of the media. Extra-curricular or community activities in parts of the school may require separate zoning or even separate heating media.

a. *Steam*

This medium has the advantage of providing quick heat pick-up. Also, it flows without pumping. Provision for future expansion is easily made. Steam is convenient for heating large areas, provided there are fairly wide tolerances of temperature control. Because steam radiation gives off heat at a constant rate, modulation is difficult to achieve.

Traps are provided to separate the condensate from the steam, and these require regular maintenance. Piping is normally pitched in divergent directions and thus requires fairly extensive clearances. In Ontario, there is a requirement for a full-time qualified attendant for all steam boilers above 5,000,000 BTU capacity.[16]

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[16] Ontario Department of Labour, *Regulations under the Operating Engineers Act, 1965* (Toronto: Ontario Department of Labour).

b. Hot water

This type of heating can be provided either direct from hot water heating boilers or through heat exchangers. It can be conveyed by gravity, using the thermal head of radiation above the level of the boiler or heat exchanger or, more commonly, by pumping through pipes. Hot water systems can be designed to allow pipes in a parallel plane to run up and down, providing proper precautions are taken to allow for venting at all high points and drainage at all low points. Good thermal control can be achieved if water temperature is modulated in accordance with load requirements and varying outside temperatures. Operating engineers are required by statute only if water is heated above 212°F at atmospheric pressure.

c. Air

Heating with air provides quick response, but if it is used as the sole medium in a space with large exposures, wide fluctuations of room temperature can result, since air temperature at terminal points may be very high. Air supply can be heated centrally or at terminal points. For zones where simultaneous heating and/or cooling are required, air heating systems can be supplemented by local radiation, or a hot and cold duct can be run in parallel to junctions that are thermostatically controlled at points of delivery. The heat transfer capability of water to that of air per pound is in the ratio of 3400/1. Thus, transporting one BTU requires considerably more space and more power by air than by water.

d. Electricity

As a heating medium, electricity can be used either in resistance elements in an air stream or in electric boilers with pumped water. When used in conjunction with a cooling system by employing the rejected heat from a condenser off the refrigeration cycle, the system is commonly called a "heat pump." Electrical panel heating is also available and may be particularly useful for some applications.

Electricity is more expensive, on a strictly BTU value basis, than any other fuel commercially available.

e. Fuels, Safety, and Operation

The selection of fuels available consists of electricity, gas, different grades of fuel oil, and bituminous or anthracite coal.

Fuels should be compared on the criteria of first cost of equipment, cost of BTU's delivered to the site, efficiency of consumption, operating costs (including all secondary costs such as electrical consumption added to fuel for pumping and preheating), maintenance costs, replacement costs, and cost of building space requirements. Consideration should be given to the operational skill needed for burning fuel and looking after the equipment and to the present and future availability of personnel with the required skills. Among the other factors which must be evaluated are soot, dirt, smells, and smoke-nuisance effect inside the school and in the neighborhood, required height of chimney, noise generation, and the need for an attendant.

Because of the difficulty of projecting operating costs of fuels into the future, and because of the possibility of emergencies or drastic changes in unit cost of fuel, changeovers to alternate fuels should be considered. Since, by statute, operating engineers are only required in boiler rooms heating water above 212°F or generating steam, the onus for considering the safety of the plant in relation to the occupants rests with the owners and the designers.
The Ontario Fire Marshal usually disapproves of the use of multi-furnaces or boilers spread over many areas; but concentrating the equipment in one "safe" boiler room does not provide a hazard-free solution, particularly if the equipment is unattended or poorly maintained.

Because of expected (and even unexpected) increases in school populations in the Metro area, boiler room layouts and/or locations should allow for future growth. The selection of equipment must be adequate from the point of view of capacity over a fairly wide range when considered in terms of its life expectancy. An initial reduction in boiler size may result in a small initial capital saving; but over the life of the heating system of the school, such a reduction may contribute to high periodic replacement costs.

11. Summer Heating

Domestic hot water can be heated by various means, including the use of the heating plant. If the latter is employed, consideration should be given to the problem of generating domestic hot water in summer when the boiler is usually inoperative.

12. Heat Transfer Terminals

Heating of the space can be achieved through use of radiant heating panels in the floor, walls, or ceiling. In the latter case, metal panels with pipes attached can be used for radiant cooling as well as for heating (provided that proper precautions are taken to control the dew point of the air within the space to prevent condensation).

Radiation can be columnar or tubular cast iron radiators or a convector cabinet containing small copper tubes with attached aluminum or copper fins, fed from header brackets. This type of heating element can also be supplied in extended form as a baseboard, or as extended fin radiation with a cabinet. The unit heater consists of a motor-driven fan circulating room air across a heating coil. The fan can be propeller type, in which case the unit is normally suspended. If used with centrifugal fans, it is contained in a cabinet and has a lower noise rating. These unit heaters are used, normally, in supplementary areas where evenness of heat and relatively high noise rating are often of no great concern.

The unit ventilator is an adaptation of the cabinet heater, but combines outside air with return air through automatically controlled mixing dampers, thus supplying cooler outside air when temperature permits.

Thermostatic control of heating elements is achieved by valves metering the flow of heating medium. In the case of fan equipment, either the coil heat is metered and/or the fan is cycled.

13. Refrigeration

Cooling is produced by the evaporation of a liquid refrigerant, which is reconverted to its liquid state first by being compressed to a higher pressure and then cooled in a condenser. Commercial refrigeration compressors are usually either of the reciprocating or the centrifugal type.

Reciprocating compressors can be used in a "direct expansion" system by connecting into a circuit with a heat exchanger coil containing the evaporating refrigerant. Alternatively, the compressor can be tied into a shell and coil evaporator, with pumped water giving off heat to the coil containing the evaporating refrigerant. The chilled water is then pumped to various terminal points.

In larger capacities (100 tons[17] and more) it is more economical to use a centrifugal compressor-chilled water package.

Centrifugal machines are generally quieter and have a longer rated life expectancy than reciprocating units. A centrifugal refrigeration machine can use a low-pressure refrigerant, which excludes it from statutory attendance requirements. Existing legislation requires attendance only for units above 30 tons.

Condensing or liquifying the high-temperature refrigerant can be done by air cooled units, by evaporative condensers, or by a cooling tower. (The use of municipal water for this purpose is restricted.) In all cases, the condensers move large masses of air. It is often difficult to locate the units so as to provide for proper operation without offending aesthetically and acoustically either the users of the school or its neighbors.

Climate Control Systems

1. Unit Ventilation Systems

The unit ventilator can be supplied with either hot or chilled water from a central plant. The automatic control of the room temperature is achieved by flow control through the coil or by operating a face and by-pass damper.

2. Packaged Air Conditioning Units

Packaged air conditioning units similar to the window type used in residences can be supplied as unitary equipment to each space. Normally the condenser of the unit is an integral part, and an outside wall or roof must provide a cavity for air egress as well as ingress. The condenser also requires drainage.

3. Variable Volume Duct Systems

A single-duct system with a variable volume control supplies air at a preset temperature to various stations. Within the space, temperatures varying from the "norm" can be achieved by throttling automatic dampers at the terminal point. The degree of control is nominal only, since too much variation can result in affecting the air stream in the space, with detrimental results and/or reactions on other terminal points upstream or downstream from the terminal station. For exterior rooms with similar external sun gains and conduction losses or gains, this system would have to be supplemented by a separate system or be separately zoned by exposure.

4. Multi-zone Systems

A multi-zone system is an all-air system which distributes a single air stream to each zone through individual ducts, each connected to the central air apparatus where automatically controlled dampers pre-mix cold and warm air.

5. Dual Duct Systems

A dual-duct system is an all-air (normally high-velocity) system with central air supply apparatus providing hot and cold air through various terminals at constant volume. Air streams are mixed locally and controlled by space thermostats.

6. Reheat Systems

A single duct with reheat is an all-air system supplying constant volume at a preset constant temperature to various terminal points. There the air is blown across a heating coil and a space thermostat regulates the heat output of the coil.

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[17] A ton of refrigeration is a useful refrigerating effect equal to 12,000 BTU per hour.

7. Induction Systems

An induction system for exterior rooms will have constant volume air supplied through a sound-attenuating chamber containing nozzles. The primary air stream will induce room air to pass across a secondary coil. This secondary air will mix with the primary air to supply air temperatures, as preselected by space thermostats, to the area. Normally, either the primary air temperature or the water temperature is kept constant while the other medium is varied in accordance with outside air temperatures.

8. Dual Conduit Systems

A dual conduit system is an all-air, high-velocity system with central apparatus supplying two air streams to each terminal point. The temperature of the constant-volume primary air varies directly with the outside air temperature. The secondary air stream is of constant temperature, but its volume is varied at each terminal point. The variable volume is controlled by interior space thermostats.

9. Heat Reclamation Systems

Increasing capital and operating costs, coupled with diminishing natural resources, make it necessary to consider the reclamation of "waste heat." This can be accomplished in various ways. The simplest is to place heat exchangers in air exhausts and air intakes. These exchangers can be coils circulating a glycol solution, or they can be slow-moving rotating wheels packed with a reflecting aluminum material. Either of these systems will convey a percentage of rejected heat from the exhaust air stream to the air in the inlet. Heat may also be reclaimed from the refrigeration compressor during periods when heating is required in areas adjacent to the skin of the building but cooling is still needed in interior spaces.

10. Maintenance

Maintenance and costs of maintenance of mechanical equipment must be given careful consideration during the planning stages of a school building. Some of the major problems are

(a) periodic routine maintenance carried out by school personnel (unskilled)—routines such as cleaning filters and oiling motors;
(b) periodic maintenance required and carried out by specialist personnel—such routines as dismantling motors, repacking bearings, and servicing of compressors;
(c) planned superannuation and replacement of specific equipment—here first cost, operating efficiency, expected obsolescence of class or kind should be considered, as well as access and working space;
(d) emergency repairs—probability varies indirectly with quality of equipment selected;
(e) major replacements—major replacement following a breakdown must be considered.

Wages of maintenance personnel and space requirements to facilitate maintenance work are additional factors which must be evaluated when considering the cost of the school. It is obviously easier, for example, to service a machine at floor level. But if servicing is required infrequently—say once a year—it may be prudent to utilize the total volume of the mechanical room more effectively by locating the equipment where access is more difficult.

One important criterion, obviously, is that the mechanical system must function during school hours. A major breakdown would severely dislocate the pupils' program and might adversely affect the board's grants from the Department of Education.

Figure 3 (sheet 15.3) is a chart which may be used by academic and technical design teams to evaluate and cross-reference some of the systems mentioned against owning/operating parameters.

Other Service Systems

Many other services and systems are required in school buildings. Local policy may affect the extent to which these are provided.

1. Hot and Cold Water

In addition to the obvious requirement for hot and cold water in such locations as washrooms, caretakers' closet(s), and kitchen(s), there are academic areas, both instructional and ancillary, with a requirement for hot and cold water. Examples would be the learning centres in the general learning area, the library workroom, and the administrative offices workroom. To reduce the number of wet points in the building, bubblers should be provided in combination with water supplies in academic spaces, rather than as separate drinking fountains. Careful attention should be paid to the insulation of the hot and cold water distribution systems. If the runs are long, consideration should be given to a re-circulating line and pump in the hot water system.

2. *General Lighting*

The present method of specifying artificial lighting standards by foot-candles is inadequate. It is not only the quantity but the quality of light that determines the "ability to see."

The term "foot-candle" is a quantitative value only, defining the amount of light falling on a surface (level of illumination). It does not take any account of contrast rendition (veiling reflections and reflected glare) and disability glare (stray light or light scatter), factors which are equally important.

A new unit of measurement of light is being developed which will take into account all three of these factors. It has been tentatively called *visual performance index* (VPI). VPI figures will presumably be adopted by the Metropolitan Toronto School Board as soon as they are obtainable.

It is of the utmost importance that a great deal of attention be given to the general lighting in the school building, particularly in instructional areas. Variable lighting levels and variable color intensity serve to stimulate people and may be helpful in extending pupils' concentration span. It would be highly desirable if some general lighting could be provided with switches which would not only turn lights off and on, but which could change the intensity of the lighting to vary with the subject matter being taught, the equipment used, the time of day, the age of the pupils, or the rapport between pupil and teacher.

Lighting in non-instructional areas is also important. For example, good corridor or circulation lighting encourages good housekeeping.

3. *Emergency Lighting*

With the advent of larger enclosed spaces and with the increased use of school buildings in non-daylight hours, emergency lighting becomes an important safety factor in buildings. The Building Fire Safety Design Standard of the Office of the Ontario Fire Marshal should be closely examined. The intent, as well as the minimum regulations, should be strictly observed. (If local standards are at variance with the Ontario Fire Marshal's requirements, local standards, of course, must be observed.) Emergency lighting is always required in auditoria, gymnasia, swimming pools, and other areas for large-group occupancy.

4. *Convenience Outlets*

It is obvious that convenience outlets in great number and density should be provided throughout the school building to permit the use of audio-visual-technological, office-type, and housekeeping equipment. Circuiting for the convenience outlets should be such that the use of this equipment will not overload the circuits and trip the breakers.

5. *Fire Alarm Systems*

Attention is drawn to the Building Fire Safety Design Standard of the Ontario Fire Marshal, Chapter 2, Section 7 and Chapter 3, Section 6. Topics include design and installation of electrical alarm systems, source of power, electrical supervision, annunciation, sounding and other warning devices, fire alarm stations, thermal detectors, smoke detectors, and fire department connection.

A careful check should be made with the borough fire chief concerning any variations from this standard.

Essentially, the fire alarm system should provide for manual and automatic sounding of alarm devices (bells or horns) and identify the source of the alarm. It should alert students and staff to evacuate the building and notify the fire fighting agency.

6. *Public Address Systems*

Many types of public address systems are currently being used in schools in Metropolitan Toronto. Frequently the system incorporates a program-sounding device, operated by the master clock system, to indicate time signals through the speakers. The central control panel is located in the administrative area, and remote points are distributed throughout the school.

The public address and intercommunication system should provide for the following functions:

(a) intercommunication between office and any one teaching station or occupied space,
(b) intercommunication between office and any number of teaching stations or occupied spaces simultaneously,
(c) "all call" from the administrative office (and possibly one or two other locations),
(d) intercommunication between any two remote areas,
(e) program signals produced by a tone generator, and
(f) distribution of program material throughout the school.

Program material may originate from an AM/FM radio tuner, automatic record player, or tape deck, as well as from multiple microphone pickup in auditoria, gymnasia, or general learning area.

It is possible that, in the future, this intercommunication system may be combined with an information system which would have both video and audio capability. Because the direction of development has not yet crystallized, however, no recommendations for provision of this capability are made at this time.

A detailed study of the requirements of the school should be made at the design stage, and provision, where possible, made for anticipated extensions or relocations of the remote points of the intercommunication system. As increasing use is made of this system, it will be necessary to use a multi-channel distribution system, rather than a single-channel or dual-channel one (the kinds in common use at present).

It should be noted that the use of handsets for teacher privacy on PA systems has become a requirement of many school boards.

7. Clock Systems

Two basic types of clock systems are currently in use: the synchronous clock system and the electronic clock system. Many are combined with a program signal system. Other elementary schools use individual, wall-mounted clocks. This third system is not recommended, since it provides no time co-ordination among areas.

It is believed that some form of time indication will be required in most areas. The selection of the type to be used is a matter of policy and economics.

8. TV Distribution System

The use of television as an educational medium is now in its infancy. It is anticipated that it will grow considerably in the next few years. It is impossible, however, to predict what forms the use of television may take.

It is recommended that accessible space be designed into the building for the provision of cabling as demand arises. However, because of the requirement of flexibility of use within spaces, the provision of coaxial cable or even empty conduits may well be a poor investment at this time. Space which is available and accessible should constitute the total provision at this time.

The possibility of a videotape distribution system within the school is already within sight. The future locations of such equipment, however, are not accurately predictable. For this reason, it is suggested that this be considered as another electronic system which must have an access channel either above the ceiling or below the floor to allow for future installations.

9. Underfloor Ducts

Power and signal distribution systems have been utilized successfully in many contemporary office buildings. This is an expensive provision. However, it is recommended that space should be allocated, possibly above the ceiling, for distribution of auxiliary power and signal to all areas.

10. Security Systems

Since the problem of malicious damage is becoming increasingly onerous, it is recommended that consideration be given to installing at least a minimum security system linked back to a central observation point. This system could consist of wire devices, radar, or sonar devices. Various systems are currently being tried in Metropolitan Toronto.

11. Building System Decisions

While services should, generally speaking, be as unobtrusive as possible, they are nevertheless essential parts of the building. Some of them must be enclosed in separate or discrete areas for reasons of personal or fire safety, convenience, or custom. Others must be distributed throughout the building but do not in themselves take up much space.

Prior to construction, the decision must be made to what degree many of these services will be installed in the building, since the cost of installing them at a later date is usually disproportionately high. This decision should only be made through the joint efforts of all members of the design group: the educator, the educational specification writer, the architect, and his consultants.

Technological developments, plus an increasing recognition of the variable characteristics and requirements of the child, are leading to far greater use of audio-visual equipment. To permit the use of presently designed equipment and to anticipate the requirements of equipment not yet designed, systems of power and signal distribution must be given serious consideration during design and construction stages. Recognition of a community responsibility for the safety of the occupants of the school building is another factor which requires sophisticated equipment. Still other factors are proper supervision of large numbers of children and administration of their increasingly varied school programs. Finally, a noticeable trend toward deep-space, loft-type structures is now apparent, and as this trend takes hold, resulting size increases will make it necessary to provide mechanical refrigeration for interior spaces on a year-round basis.

As demands for more sophisticated building services grow, ways must be found to increase plant utilization. Fortunately, there seems to be a trend toward fuller use of the school for community purposes. In the next two decades, the school building will probably be utilized for more hours of the day and for twelve months of the year. If so, full air conditioning will be mandatory, but net cost per user day would be less than today's cost. Plans for comprehensive air conditioning of a school building must, of course, be the product of compromise between economic and engineering standards.

Service Areas

1. Boiler Room

Traditionally, the boiler room has been the mechanical heart of the building. Where carboniferous fuel is used, the boiler room will probably continue to maintain this position. Normally, this area is required by building by-law to be separated from the remaining portions of the building by fire-resistant construction of one- or two-hour rating. Highly refined unitary equipment may in the future provide its own protection, but at present even rooftop units require a fire separation between the unit and the building. The boiler room must be sized to accommodate the necessary equipment for the building in question, which would include the boiler with all ancillary pumps, piping, controls, etc. Where refrigeration is contemplated as a part of a total air conditioning system, the central chiller, with its associated piping and controls, would probably be located here. Combustion air must be supplied in proportion to estimated fuel consumption rate.

a. Cooling tower
This should be located as close to the central chiller as practicable. Its requirement for large quantities of outside air can be a source of major problems in and around the building, causing, as it does, water spray, noise, and vibration.

b. Stack
Where carboniferous fuel is used, there is a requirement for a stack which in itself may create aesthetic problems. Careful attention is recommended to the protection of the population of the building and of the immediate community. Urban atmospheric pollution is already a critical problem, and it is anticipated that in future, air pollution regulations will become more restrictive and will be stringently enforced. Treatment of exhaust gases and location of discharge may soon be subject to rigid regulation.

c. Central control panel
Owing to the complexity of equipment, the shortage of trained operators, and the variable requirements within the school, consideration should be given to installation of a central control panel to monitor climate control and mechanical equipment. Such a panel should probably be located in the boiler room. This central control could be programmed to meet known variables in the requirements within the school. Where central air conditioning equipment is automatic or where unitary equipment is used, the control centre may eventually be combined with the central communication panel.

d. Acoustical Control
Equipment found in the boiler room generates the greatest amount of unwanted sound in the building. Use of vibration damping and isolating materials, use of flexible connections, and all other reasonable steps must be taken to reduce the annoyance caused the building's occupants. This is a complex problem and one which is frequently ignored in the design stages.

e. Provision for expansion
Space should be provided in the boiler room for future expansion of the central mechanical equipment.

2. Fuel Storage Area

Fuel storage, if required, must be provided in accordance with the requirements of the appropriate building and fire safety by-laws. Location of the fuel storage area should be carefully considered in the light of long-range plans for development of the building. Fuel storage capacity should be provided in accordance with good engineering practice; but in any case, there should be accommodation for not less than one month's fuel supply.

3. Fan Room(s)

The area of fan room(s) will vary with the type and extent of climate control equipment used. There may be a single central fan room with a massive duct distribution system or, alternatively, a series of smaller fan rooms at appropriate locations in the building. Access must be provided to these rooms for maintenance staff on a year-round basis.

Fan rooms will require direct access to the exterior for supply and exhaust air. To prevent cross-pollution, locations of air intakes and exhaust outlets must be carefully selected.

Attention should be paid to the acoustic and vibration isolation of the equipment in fan rooms from adjacent areas and from the structure.

4. Incinerator Room

Where local by-laws permit, properly designed incinerators with adequate pollution controls may be installed. The area in which these are installed would frequently be adjacent to the boiler room and would occupy approximately 100 square feet.

Where incinerators are not permitted, consideration should be given to bulk storage of wastes. This may call for compression equipment for baling or bulking both wet and dry materials. Provision for the refrigeration of food and wet organic wastes must also be considered if major catering facilities are contemplated in the building. Adequate connection to the service access of the building must be provided for the removal of accumulated material.

Fire, vermin, and odor are constant hazards and should receive special attention. For garbage storage, built-in fire extinguishing systems which do not require opening of doors should be considered. Ventilation of such storage spaces will be needed to prevent pollution of the rest of the building and its ventilation system. Walls, floors, and ceilings of waste storage areas should be hard, smooth, impervious, very easily cleaned, and free of re-entrant corners.

5. Mechanical Services Area

Detailed examination should be made during the planning of mechanical service areas to make sure that the *volume* of space occupied will be fully utilized. Consideration must also be given to future extensions or additions to the building and its mechanical services and to the methods of interconnecting the new and old parts. Planning should be as tight as possible, consistent with providing space for proper maintenance and/or replacement of portions of the equipment.

It is likely that the total area required for the mechanical services for an elementary (K-6) school of 550-825 pupils will be from 1,500 to 3,500 square feet. With the development of total environmental control, particularly with the increased use of unitary equipment, the gross floor area required is bound to grow. Careful evaluation must be made of the relative merits of capital cost, operation, maintenance, and continuous trouble-free operation against increased building area and the requirements of the Metro Board's Ceiling Cost Formula.

6. Electrical Services and Transformer Rooms

These small and seldom-visited spaces contain the central nervous system of the building. Here, electrical energy brought into the building at distribution voltages, generally in excess of 4,000 volts, is transformed into usable voltages for building and academic equipment. From the transformers, electrical energy is fed to a main switchboard and from there distributed through the building. Energy at different voltages is required for heavy motors and equipment, lighting, auxiliary equipment, power outlets for office and academic equipment, and power for signal systems. Each voltage requires a separate distribution system complete with distribution panels (cabinets containing protective devices), conduit runs, wiring, and a variety of outlet connections.

Adequate space must be provided for electrical switchboards, distribution panels, and transformers, all as required in accordance with the Ontario Electrical Code. The area allocated to the housing of the transformers and electrical switchgear will vary according to the characteristics of the supply voltage. This, in turn, will vary with the load (amount of power) and the standards of the utility supplying the power.

It is estimated that 250-350 square feet will be required for electrical services and transformer rooms.

7. Caretaking Facilities

Facilities for the caretaking staff are important and should include a centrally located space that can be utilized as office and materials storage. Ancillary to this should be a small washroom, including a shower, and adequate lockers for the anticipated number of full-time caretaking staff. If both sexes are anticipated, duplication of the washroom and locker area will be required.

Provision must be made in the caretaker's office for house telephone and outside telephone. This area should provide space for a key cabinet, fire alarm annunciator panel, time clock for staff, bulletin board, and connection to the public address system and/or master clock and program system. A central control and monitoring panel for the climate control system and equipment might also be located in this area.

The caretaking office-storage area, including adjacent washrooms and lockers, should occupy an area of about 275-350 square feet.

8. Caretaker's Closets

At least on each floor level, and preferably more frequently if the school plant is an extended structure, provision should be made for storage of cleaning equipment and materials. Properly designed storage racks should be included to accommodate either a cleaners' truck or mop, bucket, push broom, corn broom, dustpan, whisk, cleaning rags, vacuum cleaner and/or floor scrubber. A small quantity of consumable supplies for washrooms would also be stored here. Provision should be made for easy filling and emptying of buckets, either by proprietary slop sink or, preferably, by a sturdy, wall-mounted, combined-spout water supply with a floor-mounted receptor. An area of 20-25 square feet each would be adequate for these rooms.

9. Outside Storage

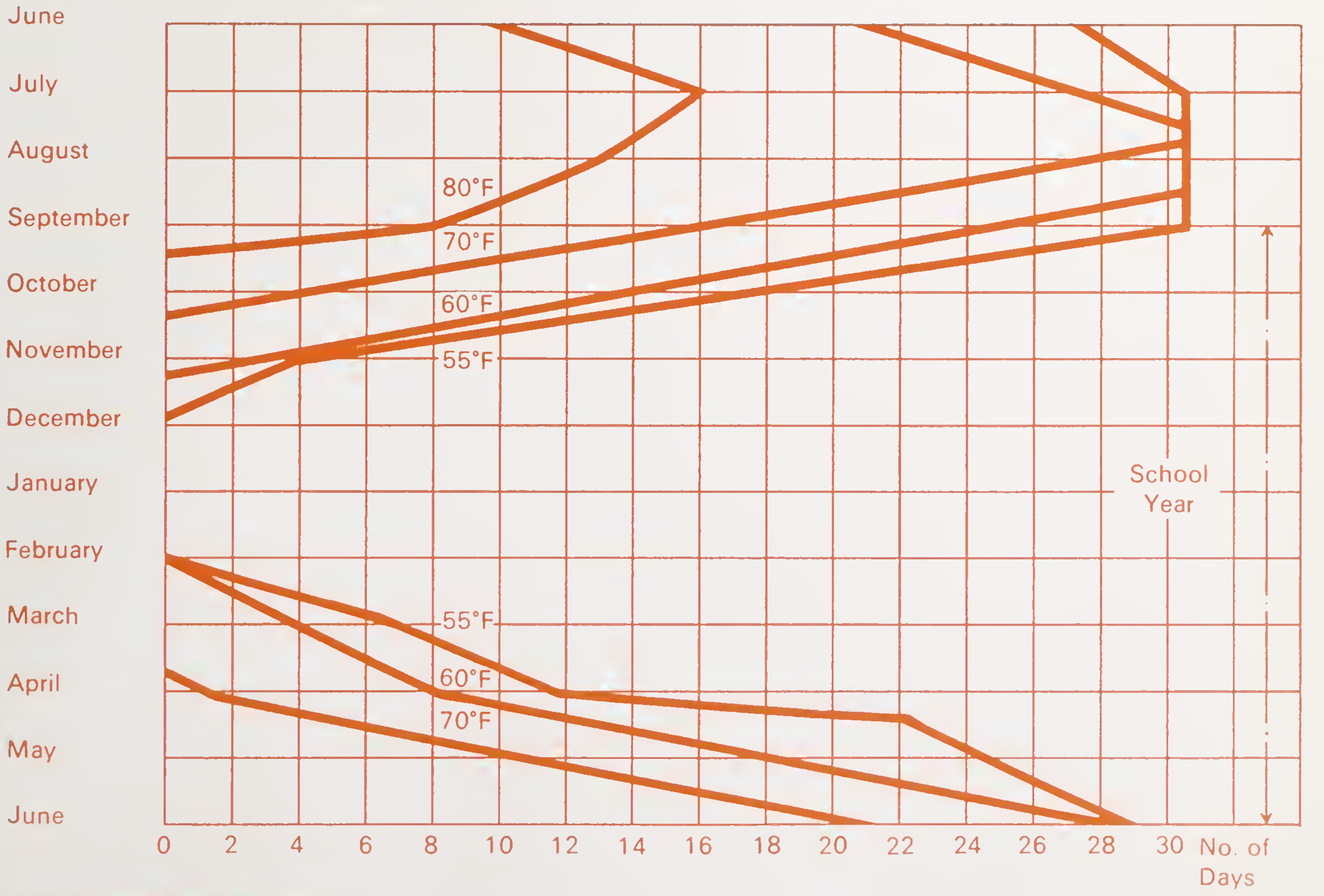
For storage of grounds maintenance equipment and materials, there should be a storage area with direct access to the outside. An area of about 75 square feet should be adequate.

Conclusion

It is recommended that the whole purpose of academic buildings be carefully evaluated. Buildings are for people. They are tools to be used in the processes of fostering the development of children and meeting the needs and expectations of society. If better buildings can contribute to the efficiency of these processes, the conclusion that better buildings should be provided is inescapable.

Figure 1

Mean of minimum and maximum number of days when maximum temperature exceeds indicated temperature



Source G Granek & Associates Observations

Figure 2

Revised ASHRAE Comfort Chart 1967

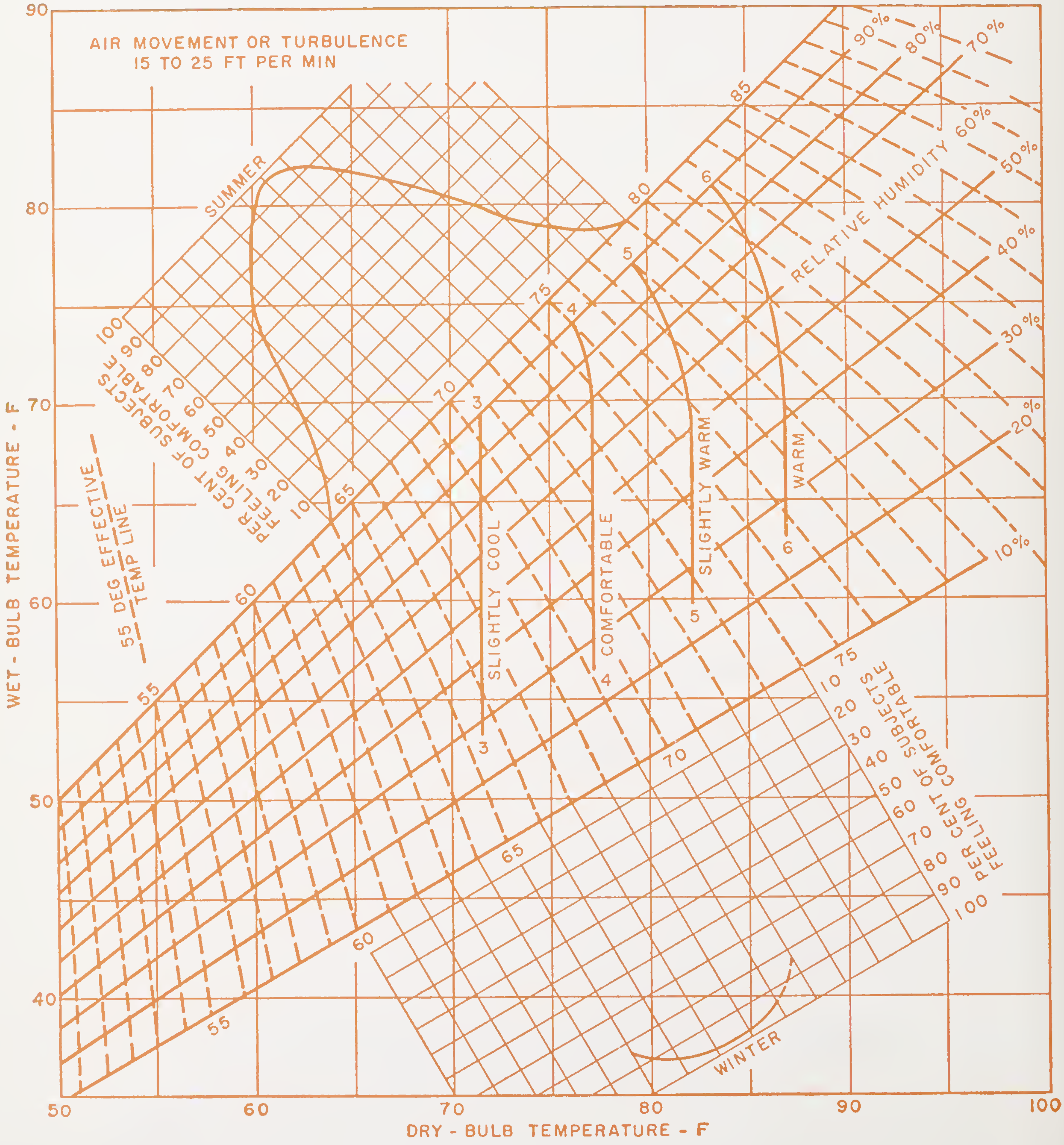


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Figure 3

Comparison chart of climate control systems

Introduction	Dual Conduit	Pack. Equipment	Reheat	Double Duct	Multi-zone	Variable Volume	Unit Ventilators	
								Capital Cost
								Fixed Annual Cost
								Maintenance Cost
								Serviceability
								Cost of Operator
								Fuel Cost
								Cost of Electricity
								Air Movement
								Temperature Control
								Flexibility
								Humidity Control
								Filtration
								Noise Control
								Aesthetics
								Space Occupied

Part 4

Conclusion

Children now in elementary school will reach adulthood in the 1980's. They will need to investigate, for themselves, such problems as urban planning, housing, use of leisure time, transportation, poverty, pollution, and social injustice. They must therefore be encouraged to learn on their own, exploring areas of knowledge, searching for relevant information through the use of many different media.

Photo courtesy Information Branch, Ontario Department of Education.

Chapter 16
A Brief Concluding Statement

During the past few decades, our society has been undergoing vast and fundamental changes, the driving force behind which is the geometric progress of the technical-scientific revolution. The depth, range, and acceleration of change is transforming our total environment.

Three Change Pattern Trends and their Impact on Education

Many change pattern trends are evident. Three in particular indicate that they will continue to reshape our environment in future decades. These three are world urbanization, industrial automation, and the information technology revolution.[1]

In describing the impact of these trends, Richard L.Shetler, President of General Learning Corporation, Washington, D.C., indicates that each will produce a whole host of independent effects, as well as reacting on and intensifying the effects of the others.[2] The implications for education are profound. It is certain that the demands for scientific, technical, and sociological competencies, as well as for attitudes flexible enough to cope with changing conditions, will continue to increase. Consequently, the provision of improved educational methods and facilities is imperative.

In this decade, education is rapidly assuming a new position as our core industry. In terms of need, costs, and the increasing numbers of people involved, education is a major enterprise. It must become more efficient and effective in coping with the demands of a rapidly changing environment. If, for instance, we are able to forecast a changed economic and social environment for the decade of the 1980's, why should we not now include in our school curriculum learning opportunities which will help our young people to cope with problems they will face in the 1980's? We must, of course, provide training leading to scientific and technical competencies. But we shall also need to prepare students to deal with such problems as urban planning, housing, use of leisure time, transportation, poverty, pollution, and social injustice. Professor John I.Goodlad of the University of California suggests that such programs "would not be organized around subjects at all but might well reach . . . young people in ways that present school fare seems not to do."[3]

The Need for Educational Planning

There is now growing support for the idea that the rate of change within the educational system should correspond to that of the total environment. But the attainment of this goal would involve the realignment of the total educational structure. Such realignment will not occur so long as we continue to rely upon *ad hoc* or short-term approaches to the solution of problems. It demands the development of long-term, systematic, and highly predictive methods of educational planning. The need for sound forecasts of future educational requirements makes it mandatory that we commence now the systematic gathering of reliable data and estimates. This would require the processing of data concerning such matters as the curriculum, learning requirements, teaching functions, psychological and biochemical approaches to learning and memory,[4] equipment needs, educational financing, and school building design requirements. The results of such planning could provide the educational decision-makers with valid syntheses and reliable guidance in assigning priorities and choosing between alternative courses of action.

The Role of SEF

The Study of Educational Facilities has been established to provide the educational authorities of Metropolitan Toronto with this kind of information concerning the field of school building design.
The Study represents the beginning of a process of long-term and systematic planning. In the course of our activities, it has become increasingly obvious to us that continuous and long-term study will also be required in the much broader area of educational requirements and functions. In the final analysis, educational functions should determine school design. Tomorrow's educators must therefore be provided with school interior design forms which will aid—not hinder—educational change and innovation.

The educational requirements for elementary (K-6) schools presented in this first Report are our best estimates of future needs. They are not intended to be final solutions. The contents of this Report will require constant review, revision, and updating.
It is our hope, however, that it will constitute a preliminary step in Metropolitan Toronto toward the institution of a continuous process of systematic educational planning.

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[1] Richard L.Shetler, *Major Problems of Society in 1980* (Designing Education for the Future, No 1; New York: Citation Press, 1967), p. 261

[2] *Ibid*

[3] John I.Goodlad, *The Educational Program To 1980 and Beyond* (Designing Education for the Future, No 2, New York Citation Press, 1967), pp 57-58

[4] Charles F Kettering Foundation, *The Chemistry of Learning* (IDEA Occasional Paper; Melbourne, Fla Charles F.Kettering Foundation, 1967)

Terminology

Ambient Noise Level. The level of noise which exists in an unoccupied space, with the air conditioning, ventilation, and lighting functioning.

Ambient Temperature. Overall average temperature.

Air Filter Efficiency. The percentage of particles removed from the air. For particles of 5M (Microns) and greater, the efficiency is determined by the AFI weight test; for particles of 4M (microns) and less, the efficiency is determined by the dust spot method.

BTU (British Thermal Unit). Approximately the heat required to raise the temperature of a pound of water from 59°F to 60°F.

C.W. Cold water.

Central Common. A central portion of the General Learning Area, a common area for all the teaching stations. Its size depends on the number of teaching stations. (Six teaching stations should have a common of approximately 1,500 square feet.) It contains spaces for large and small groups. It may contain learning centres.

Central Participation Area. See Central Common.

Comfort Zone. The range of effective temperatures over which the majority (over 50 per cent) of adults feel comfortable.

Common Area. See Central Common.

Continuous Progress (see also Nongrading). Continuous and independent movement of each pupil through a school program. A pupil may progress slowly without failure, or quickly without acceleration. Continuous progress also allows for slow and rapid periods of development within each child.

Discovery Approach. Direct experiences used to promote inquiry. There must be time and freedom to perceive, reflect, compare, and connect.

Effective Temperature (ET). An arbitrary index which combines into a single value the effect of temperature, humidity, and air movement on the sensation of warmth or cold felt by the human body. The numerical value is that of the temperature of still, saturated air which would induce an identical sensation.

Evaluation of Students. Systematic collection of evidence about student performance.

General Learning Area. Clustering of two to eight (or more) classrooms in an open area with a flexible interior partitioning system. The area contains teaching stations, learning centres, central common, seminar areas, and a teacher workroom, as well as auxiliary areas such as washrooms and outdoor clothing facilities.

Generated Noise Level. Noise which is generated by the occupants and their activities within a space.

H.W. Hot water.

Hardware. Instructional devices or machines, including all types of film projectors, tape recorders, videotape recorders, talking typewriters, presentation devices, computers, radio, TV, and overhead projectors.

Horizontal Integration. Integration among learning experiences, or subjects, at any one time in a school career.

Individual Differences. A term which emphasized the uniqueness of the person. The term refers to the full range of variability among individuals in demographic and physical characteristics and behavioral performances.

Individualized Instruction. Acceptance of the fact that each child is an individual and must learn as an individual. Full implementation would demand specialized sequences of instructional materials (software), ideally of highly sophisticated design.

Integrated Curriculum. A unified curriculum which includes both horizontal and vertical integration.

Language-Experience Program. Use of each child's experiences and interests to lead him into the world of printed language. The program may be applied to any subject and will promote the integrated curriculum.

Learning Centre. A portion of a teaching station or of the central common that is designed for individual study or small group activities, connected with social studies, language arts, mathematics, science, and arts and crafts.

N.C.—Noise Criteria or NC curves. A curve which specifies the top limit of noise in a given space.

These curves are related to the mid-band frequencies of from 31.5 cps to 8,000 cps (see ASHRAE Guide and Data Book).

Nongrading (see also Continuous Progress). An organizational scheme in which the emphasis is on sequential goals, varied materials, small group instruction, flexible grouping, and sequential evaluation.

P.A. Public Address system.

Process or Structural Approach. The attempt to use the central notions or essential operations of a subject as a focus for curriculum design and teaching. This approach does not ignore content but emphasizes the kinds of inquiry which have brought a subject into being and sustained its growth.

Relative Humidity (RH). The ratio of actual partial pressure of the water vapor to its saturation pressure corresponding to the Dry Bulb Temperature. (RH is a saturation ratio.)

Reverberation. The persistence of a sound within a space after the sound source has been terminated. Reverberation time is usually measured in seconds.

Room Pressure. Pressure measured in inches by Water Gauge.

Software. Programs and materials which are presented via machines, i.e., via hardware.

Structural Approach. See Process or Structural Approach.

Teaching Station. Approximately 750 square feet of space within a General Learning Area. The station provides teaching space for variable groupings of up to 35 pupils and one teacher. It may be either open or enclosed.

Team Teaching. A form of organization in which teachers function as a team. There is usually some combination of large group instruction, small group instruction, and individual study. There are many possible combinations of grades, subjects, and teachers.

Vertical Integration. Continuity among the experiences of the child as he moves from one level of schooling to another.

Visual Performance Index (VPI). A new method of specifying artificial lighting standards.

It is felt that the present method of specifying artificial lighting standard by foot-candles is inadequate. The term "foot-candle" is a quantitative value only, defining the amount of light falling on a surface (level of illumination); it does not take any account of contrast rendition (veiling reflections and reflected glare) or disability glare (stray light or light scatter), factors which are equally important.

The Visual Performance Index (VPI), which is presently being developed, will take into account all three of these factors. It is therefore suggested that this Index be adopted by the Metropolitan Toronto School Board. It is anticipated that Index figures will be available shortly, at which time they will be incorporated in the Technical Data Sheets of this Report.

Water Gauge. A specific type of manometer, which is an instrument for measuring pressures: essentially a U-tube partly filled with water, so constructed that the amount of displacement of the water indicates the pressure being exerted on the instrument.

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